

Knürr® DCL User Manual



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Unit configuration number

Model number - Part 1/2										Model details											Part 2/2			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
D	C	L	3	0	L																			
D	C	L	3	4	H																			
D	C	L	3	0	R																			

1.-3. DCL (Data center rack cooling solution)

DCL – Data Center Loop

4.-5. Nominal cooling capacity

30 – 30 kW (2,000 mm / 42U)

34 – 34 kW (2,200 mm / 47U)

6. Type of application

L – closed loop architecture (without external panels)

H – hybrid architecture (without external panels)

R – in row cooling (with external panels)

7. Depth

1 – 1,000 mm (DCL-R version only)

R – 1,100 mm (not for DCL-L version)

2 – 1,200 mm

H – 1,300 mm

8. Mechanical options

0 – none (two units per pallet possible)

D – caster bracket (only one unit per pallet with ramp)

9. Electrical connection

2 – 230V AC 1-phase 50/60Hz CE

4 – 230V AC 1-phase 50/60Hz CE with A/B-transfer switch

A – 230V AC 1-phase 50/60Hz 2-pole CE

B – 230V AC 1-phase 50/60Hz 2-pole CE with A/B-transfer switch

P – 208 / 230V AC 2-pole 50/60Hz CSA

S – 208 / 230V AC 2-pole 50/60Hz CSA with A/B-transfer switch

10. Water connection / hex

Z – bottom

Y – top

9 – top and bottom

V – redundant bottom (valves external)

11. Filter (only for DCL-R)

N – no filter

A – MERV 1 (NA for 1,000 mm depth)

C – MERV 1, clog switch (NA for 1,000 mm depth)

12. Display

0 – none

Y – 5.7" display (14.5 cm) touchscreen

13. Preparation for automatic door release system

0 – none

1 – prepared for one DCM server rack

2 – prepared for two DCM server racks

3 – prepared for three DCM server racks

4 – prepared for four DCM server racks

14. Chilled water monitoring/Condensate pump

0 – none

T – temperature sensor inlet/outlet

4 – calorific meter

5 – condensate pump

6 – temperature sensor inlet/outlet + condensate pump

7 – calorific meter + condensate pump

15. Environment monitoring

0 – none

S – smoke detection

H – humidity monitoring

B – smoke detection and humidity monitoring

16. Color

1 – RAL 7021 (grey - black)

G – RAL 7035 (light grey)

2 – non standard color (SFA)

17. – 18. Free

19. Communication

0 – standard (HTTPS, SSH, MODBUS TCP, SNMP)

D – input/output customer

M – Modbus RTU

B – Bacnet

V – input/output customer + Modbus RTU

W – input/output customer + Bacnet

20. Server rack monitoring

0 – none

1 - door contacts 1 rack

2 - door contacts 2 racks

A - door contacts 3 racks

B - door contacts 4 racks

3 - 2 temperature sensors 1 rack

4 - 2x2 temperature sensors 2 racks

C - 3 x 2 temperature sensors 3 racks

D - 4 x 2 temperature sensors 4 racks

7 - door contacts + temperature sensors 1 rack

8 - door contacts + temperature sensors 2 racks

E - door contacts + temperature sensors 3 Racks

F - door contacts + temperature sensors 4 Racks

21. Packaging

P = Land freight – short distance (pallet, shrink wrap, cardboard protection)

S = Seaworthy (air freight) – long distance (wooden crate)

22. Special features

A = No SFAs, standard unit

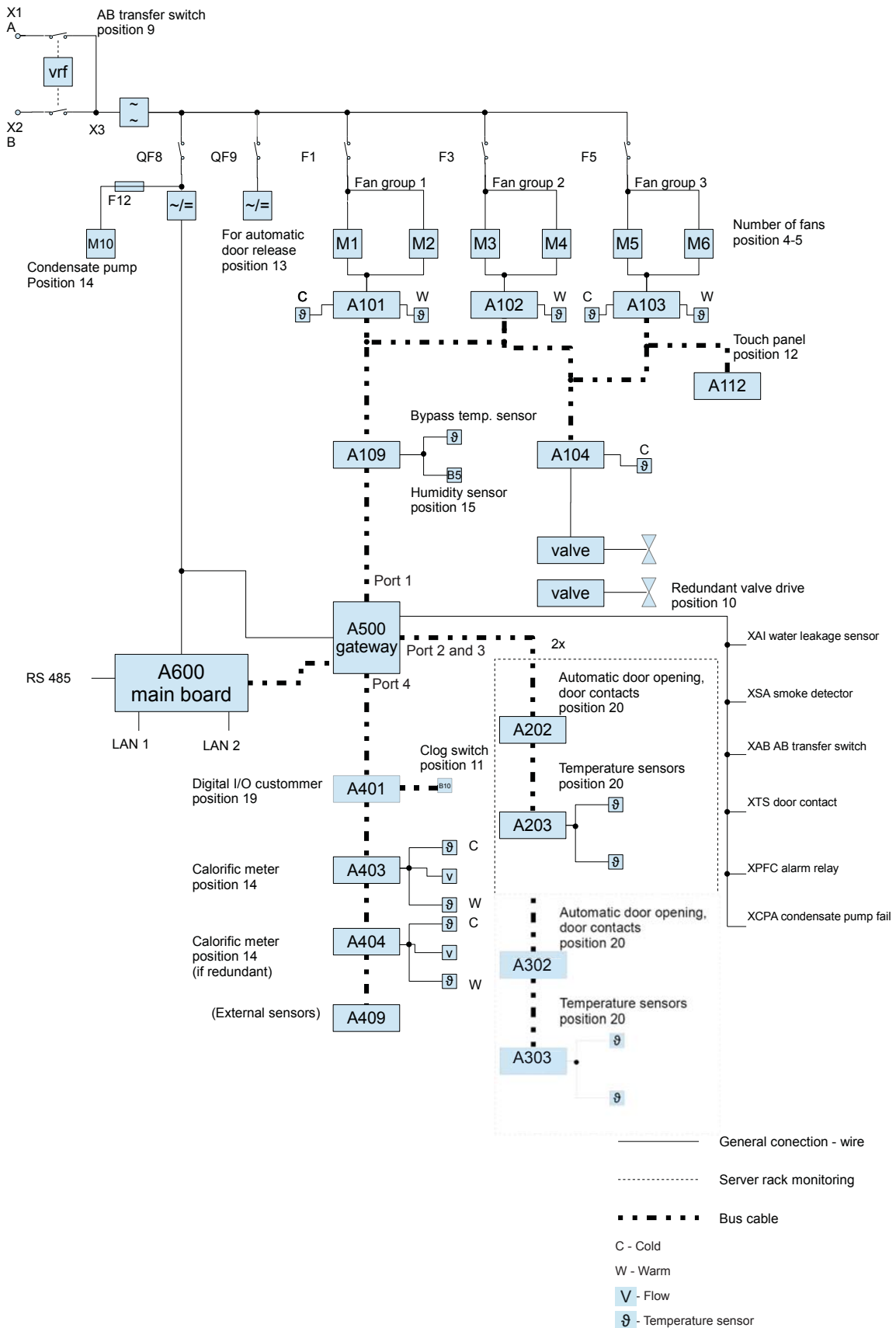
X = SFA included

23. – 25. Factory configuration number

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Block diagram



1 Safety

1.1 Safety symbols



Attention! Danger spot! Safety notice!



Hazard by electrical current or high voltage



Caution! Hot surface



Caution! Rotating parts / automatic start



Disconnect from power prior to works!



Attention! Refers to possible damage to the device



Hazard by electrical voltage



Note! Marks possible hazards for the environment



Important note, information

1.2 Safety notice



Our engineers can give you comprehensive advice in assembling the Knürr DCL. Extensive material, functional and quality testing guaranty high benefit and a long life-cycle.

Nonetheless, such devices may cause hazards if improperly handled by untrained personnel and if used for purposes they are not intended for.



Carefully read this assembly and operational manual prior to assembling and commissioning the Knürr DCL.

The electrical equipment corresponds with applicable VDE and accident prevention regulations. There are hazardous voltages (higher than 50V AC or higher than 100V DC):

- behind cabinet doors
- at the fans and their hook-ups

Use genuine fuses of the specified current.

Immediately switch OFF the device if there is any disturbance in the electrical supply or in the cold water supply.



Hazard by electrical voltage.

Maintenance and cleaning works are only permitted to be performed by trained personnel, whereby such personnel must safeguard that the device is free from voltage at the time of maintenance and cleaning. Therefore, prior to any works, please take the device out of operation in accordance with instructions. Internal sockets can be used only by authorized personnel.



Hazard by works on the device carried out by non-experts. Maintenance and cleaning works are only permitted to be performed by trained personnel. In order to keep the device in operationally safe condition and its long life-cycle, maintenance and cleaning intervals must be observed by all means.



Operate the Knürr DCL only in accordance with its specified purpose, within its limits of capacity and approved operating means.

When performing any works on and with the device, please observe:

- Any respectively applicable regulations (e.g. VDE regulations or other nationally applicable guidelines)
- Any applicable accident prevention regulations (BGV)
- Any respective provisions
- Any applicable environment protection acts



Operate the device only in its proper condition. In the event of functional disturbances or deficiencies, the device must immediately be taken out of operation and the operator's responsible person must be informed of its state. The device must only be taken into operation again after the flawless function of the device has been restored.



Caution! Hot surface!

Defect fans, power supply units or control boards may have run hot. Allow them to cool down prior to any works.

2 Application conditions

Appropriate use



The device is an add-on/in-row cabinet for circulation cooling and is only used for the removal heat from server cabinets to protect temperature-sensitive components. The cooling system (cabinet – Knürr DCL) works thermally independent of the room air or as an open system in conjunction with open server racks.

The total heat load issued from the installed equipment is taken out to be absorbed by a chilled water circuit in the building.



For reliable function of the DCL, chilled water must be available in an appropriate amount, at the appropriate temperature and pressure. The water quality must be in accordance with table on page 65 (see Annex).



One of the fans must be running at all times (at least at minimum speed)! If this requirement can not be met the chilled water supply must be stopped! This requirement is crucial for the device proper function!

Ambient temperature at the site of installation
(Air supply side)

10°C to 35°C (40°F to 95°F)
(other temperatures upon request)

Absolute humidity at the site of installation
Water temperature, feed

Recommended 8 g H₂O/ kg air
4 - 20°C

Nominal capacity at

10°C (50 °F) feed
16°C (61 °F) return

Use of anti-freeze in chilled water

Not recommended (upon request)

Water connection

Top or / and bottom (see Unit code)

Condensed water connection

Top or / and bottom (see Unit code)

Max. operating pressure

10 bar (145 psi)

3 Description

3.1 General function

Knürr DCL is a chilled water cooling unit to be installed side by side with racks. Its modular design permits to be added on to the right, to the left or on both sides, and also centrally between two server racks to be cooled. There is a possibility to adjust air flow pattern using modular panel system. Knürr DCL complies with the conditions of EN 60950.

Heat emitted by installed equipment (e.g. servers) is reliably removed using the cold water system integrated in the Knürr DCL. The cooling system is entirely safe in itself, so that water is prevented from ever entering the server area.

Air that has been heated by the server (to e.g. 35°C) is led through the laterally arranged wall openings or through the rear door to a special air/water heat exchanger. Heat is absorbed there and the air is cooled down to e.g. 20 - 25°C. The cooled air is now provided again by speed-controlled fan boxes at the front of the server. Non-return valves thereby prevent any re-circulation within the fan boxes.

The chilled water is provided by a water chiller installed in the building. Below the heat exchanger, there is a tub for collecting condensed water, with a 5/8" outlet. The Knürr DCL can optionally come with a condensed water pump to pump the possibly accumulating condensed water into the existing drainage system.



Attention! The Knürr DCL only works if the cold fresh air to the server and heated return air from the server have fully been separated. Height units not in use have to be sealed using blanking panels.

3.2 Modes of operation



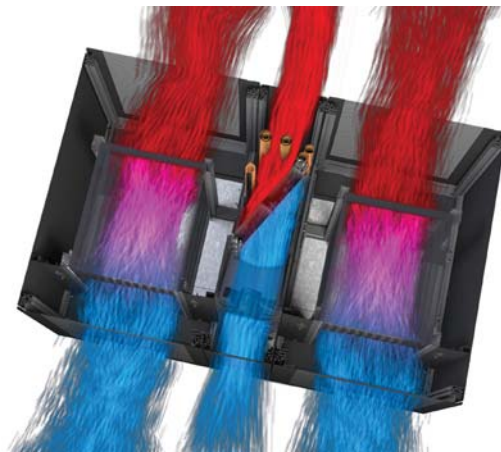
Closed loop mode of operation DCL-L

Closed loop mode of operation completely contains cooling air. This solution is suitable for higher densities.



Hybrid mode of operation DCL-H

Hybrid mode contains the hot air released from the servers while the cold air is released into the installation area. This mode supports “Cold room” concept - no heat is released into the room.



In-row mode of operation DCL-R

In row mode of operation draws and releases the air out and into the installation area. This setup is suitable for lower heat densities.

In all of above scenarios multiple units can be used to cool one rack (to gain desired levels of redundancy), or single unit could be used for multiple racks if desired.



In the event of any failure of the cooling plant, the server cabinet doors are to be opened (H and L versions) in order to avoid any heat from piling up inside the rack housing. In such case, the heat is discharged as thermal load to the ambient room of installation. (Automatic opening is optional)



In the event of any failure of the Knürr DCL fans, the device doors are to be opened in order to avoid any heat from piling up inside the housing. In such a case, the heat is discharged as thermal load to the ambient room of installation.

Note: Optionally, automatic door opening at the server rack can be provided which would facilitate the use of ambient air for cooling the server temporarily.



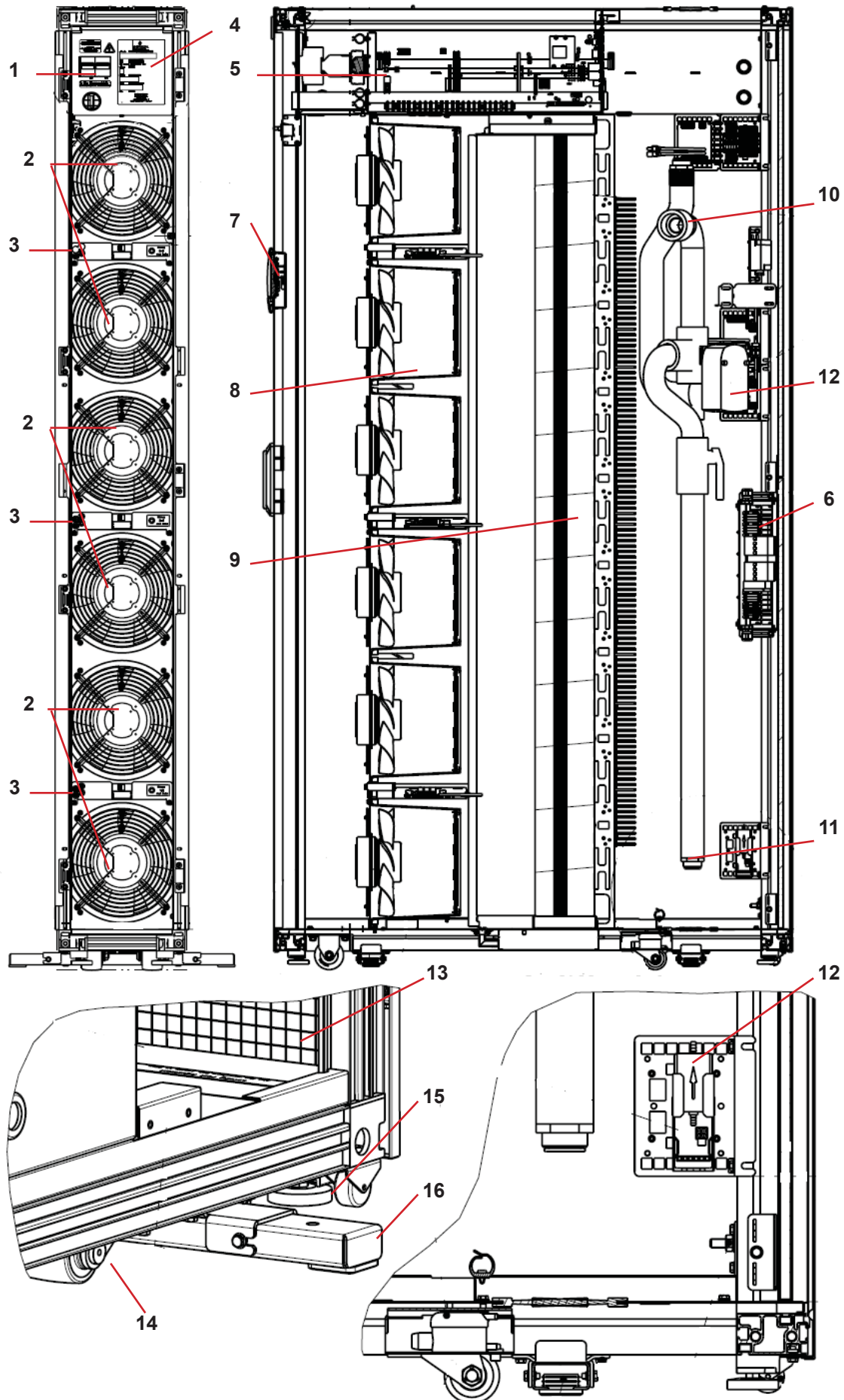
For maintenance purposes, both the front and the rear doors can be opened jointly or separately. However cooling of the equipment must be granted.

3.3 Overview and dimensions

	DCL 30	DCL 34
Nominal cooling capacity*	30 kW	34 kW
Air flow (without filter)	5000 m ³ /h (3237 CFM)	6000 m ³ /h (3885 CFM)
Water flow	4.5 m ³ /h (20 GPM)	5.0 m ³ /h (22 GPM)
Max. water pressure	10 bar (145 PSI)	10 bar (145 PSI)
Number of fans	5	6
Fans power consumption	5x170 W	6x170 W
Dimensions (WxDxH)	300xD**x2000 [mm]	300xD**x2222 [mm]
Heat exchanger internal fluid volume	10,72 l (2.83 gal.)	11,93 l (3,15 gal.)

* Sensible cooling, at 10°C / 16°C (50°F / 61°F) water temperature, and 37°C (100°F) air inlet temperature

** Depends on unit configuration - See unit configuration number (dimensions 1000mm, 1100mm, 1200mm, 1300mm)



Knür DCL Cross-section
12

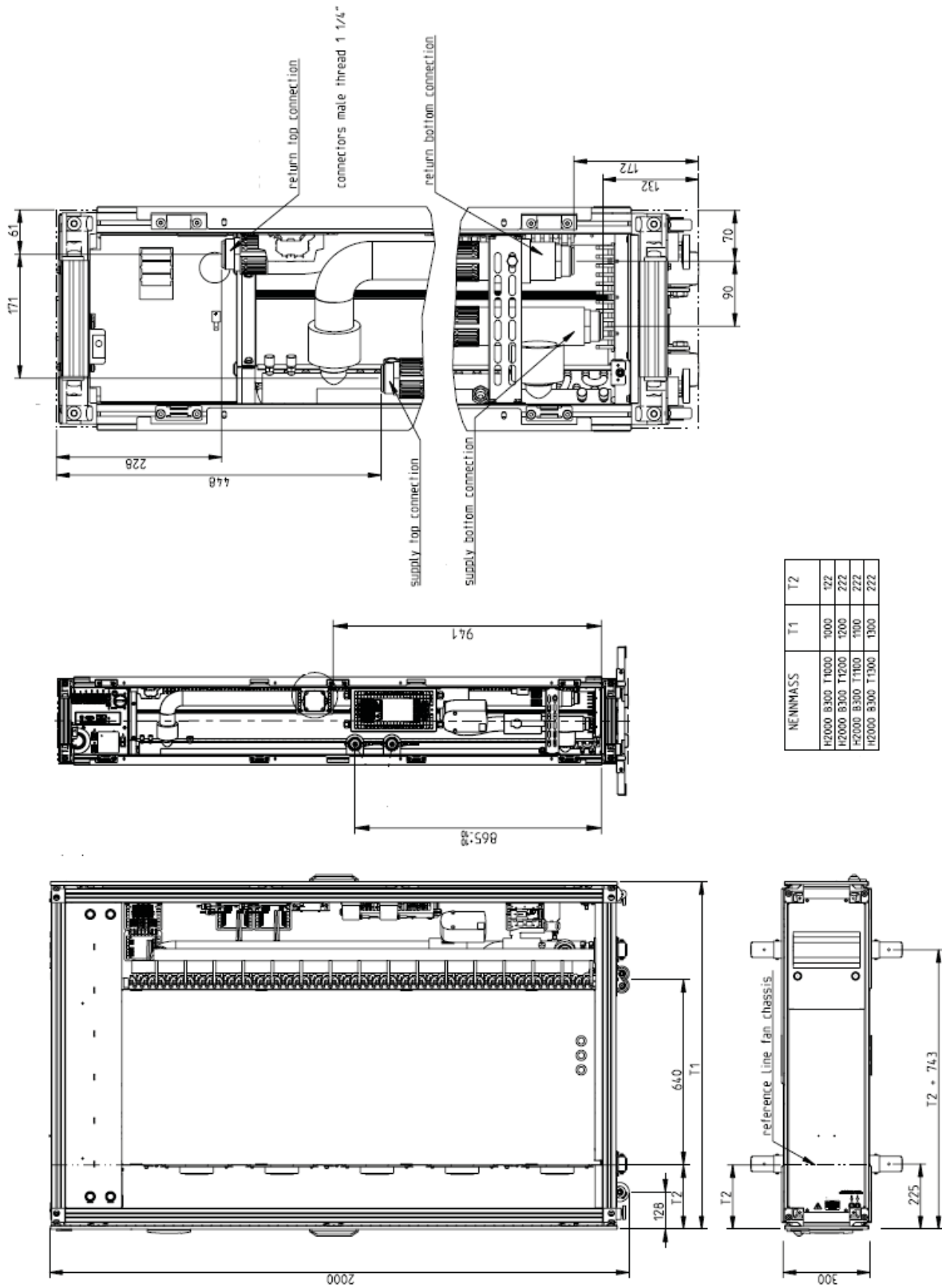
Nr.	Description
1	Electronics MCB
2	Fan groups (5 or 6 fans total - depending on version)
3	Fan group MCB
4	ID tag
5	Electronics box
6	AB transfer switch
7	Display
8	Fan inlet rings (one for each fan)
9	Heat exchanger
10	Chilled water connection top (see unit code)
11	Chilled water connection bottom (see unit code)
12	Condensate pump (option)
13	Air filter (option)
14	Casters (option)
15	Levelling feet
16	Stabilizer bar (option)

* Table contains optional features. Please see unit configuration number

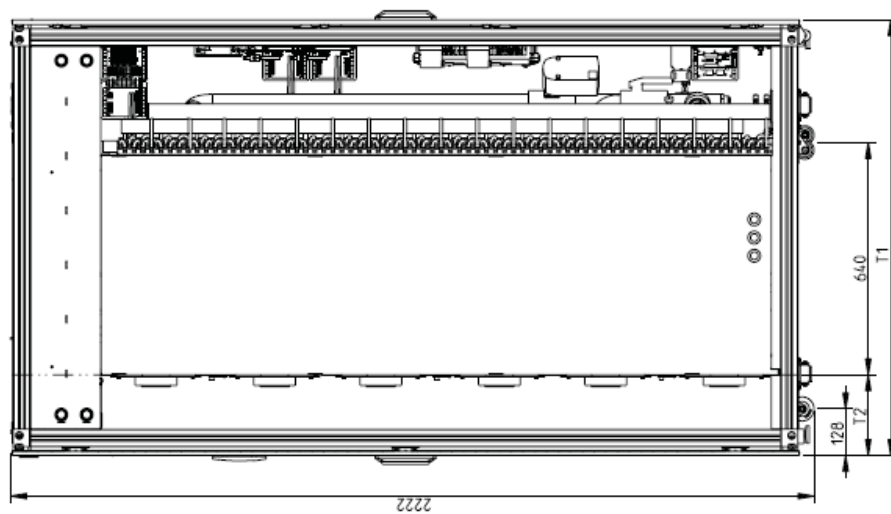
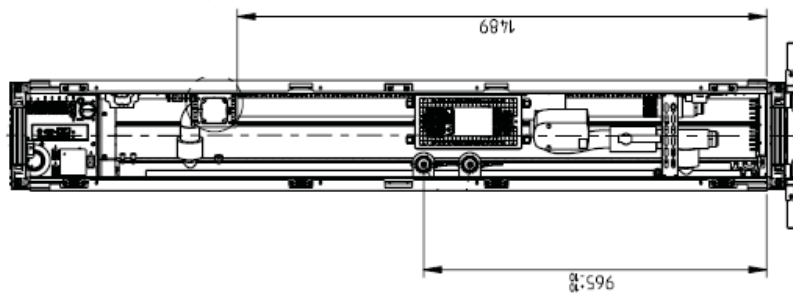
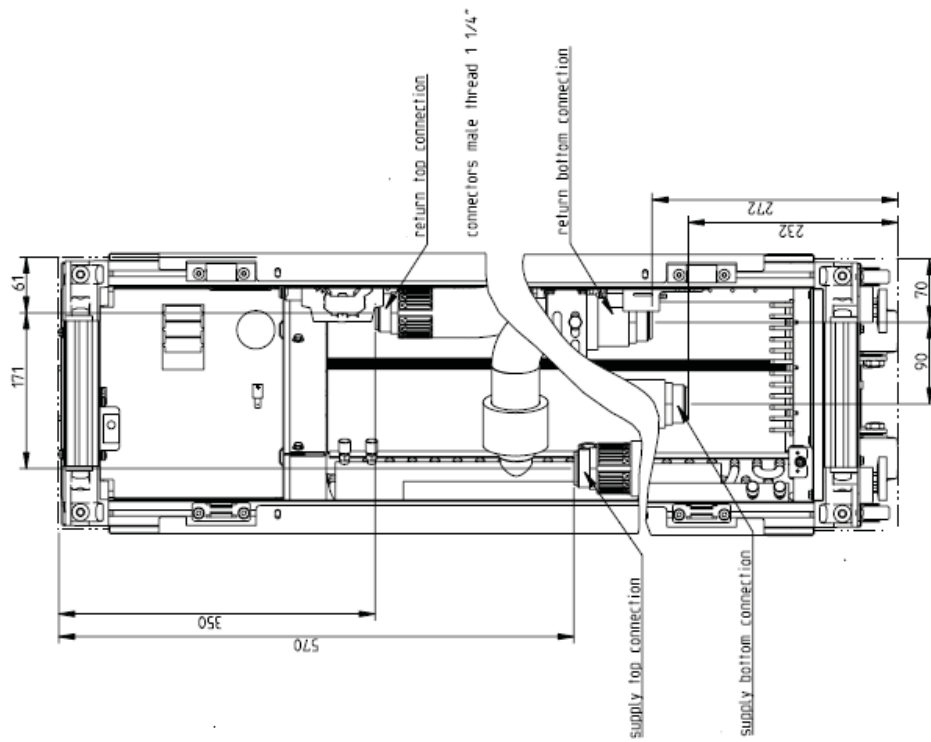
Component location

Frame depth	Dry net weight +/- 5%	
	DCL 30	DCL 34
1000 mm	162 kg / 356 lb	180 kg / 396 lb
1100 mm	166 kg / 356 lb	184 kg / 405 lb
1200 mm	170 kg / 374 lb	188 kg / 414 lb
1300 mm	174 kg / 392 lb	192 kg / 423 lb
Land freight packaging	+40 kg / 88 lb	+40 kg / 88 lb
Seaworthy packaging	+125 kg / 276 lb	+125 kg / 276 lb

Unit weight

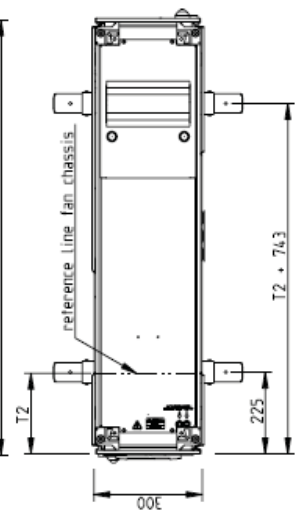


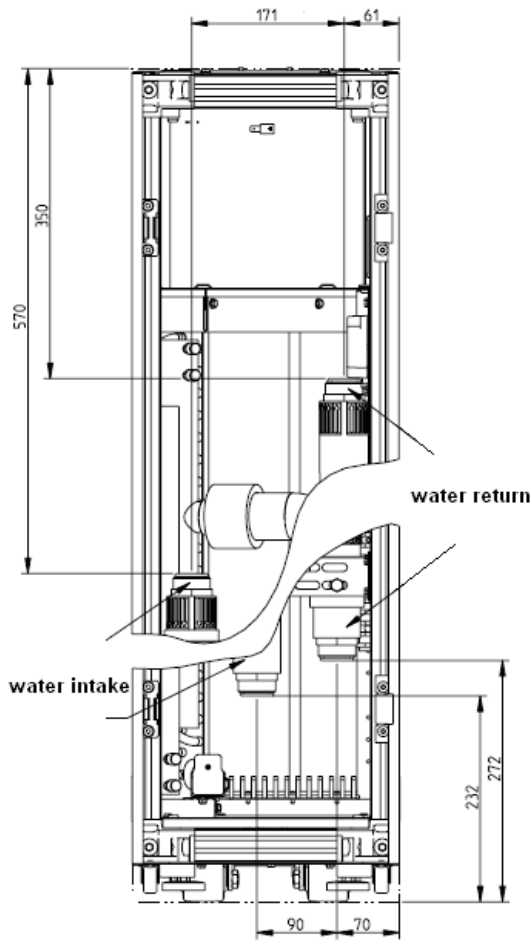
30 kW unit drawing



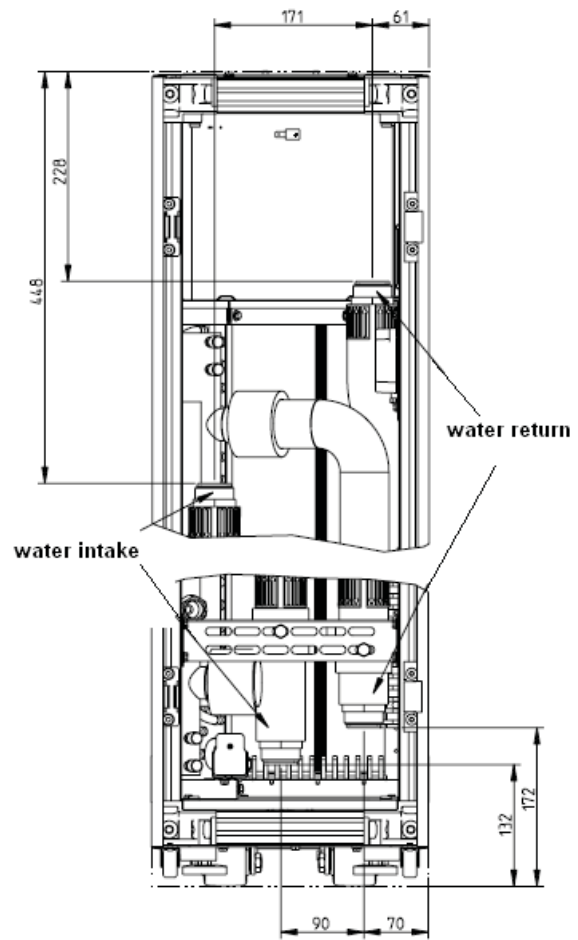
	T1	T2
H2200 8300 T1000	3000	222
H2200 8300 T1200	3200	222
H2200 8300 T1100	3100	222
H2200 8300 T1300	3300	222

34 kW unit drawing

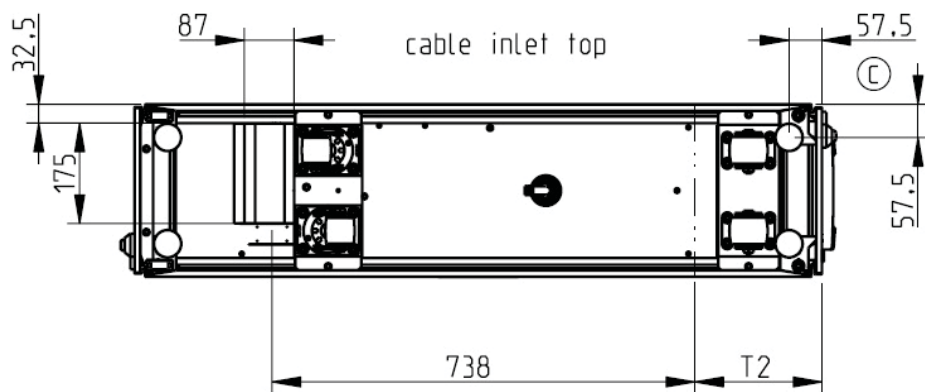




DCL 34 2222 mm unit

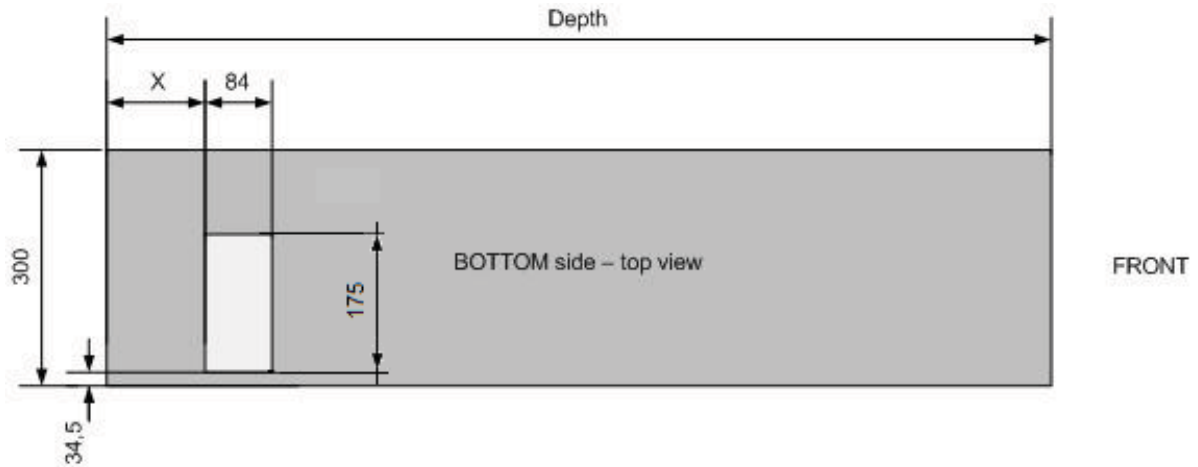


DCL 30 2000 mm unit



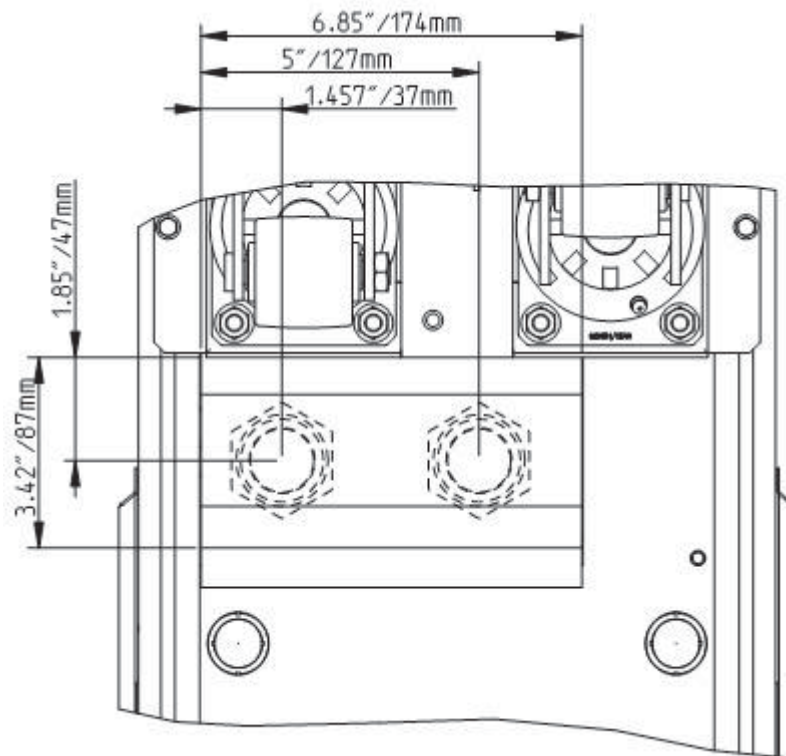
Dimensions	T1	T2
H2000 B300 T1000	1000	122
H2000 B300 T1200	1200	222
H2000 B300 T1100	1100	222
H2000 B300 T1300	1300	222

Levelling feet position



Depth [mm]	X [mm]
1000	97
1100	197
1200	197
1300	297

Floor cutouts dimensions



Chilled water connection location



The air inlet/outlet opening must in any case be kept unobstructed to guarantee free air circulation. Do not cover them by separate installation, such as socket strips.

3.5 *Technical specifications*

Housing material	Frame from aluminum profile / steel sheet, galvanized and powder coated
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Ambient temperature range	10°C to 35°C (40°F to 95°F)
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Absolute humidity	Recommended 8 g H ₂ O/ kg air
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Cold air outlet after heat exchanger	20 - 25°C acc. to ASHRAE
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Temperature difference via server	Approx. 15K, depending on server equipment
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Chilled water

Cooling capacity depending on number of fans:	30 kW (5 fans) and 34 kW (6 fans)
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Chilled water temperature, feed	4 - 20°C
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Nominal capacity at	10°C / 16°C (50°F / 61°F) water temperature, and 37°C (100°F) air inlet temperature
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Max. operating pressure, chilled water	10 bar (145 psi)
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Connection feed/return	1 ¼", male thread (ISO 228) - union connection (flat sealed)
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Effective cooling capacity	Number of fans	Height	Width	Depth	Chilled water flow	Pressure loss DCL	Pressure loss connecting set	Air flow	Electrical connections	External power supply / Fusing
kW	-	mm	mm	mm	m ³ /h	kPa	kPa	m ³ /h	V /Hz	A / mm ²
30	5	2000	300	1000 1100 1200 1300	4,5	51,0	6,8	5000	230V AC 50/60Hz 208 / 230V AC 50/60Hz	16 / 3 x 2.5 (C type tripping character- istic)
34	6	2222	300	1000 1100 1200 1300	5,0	62,0	8,3	6000	230V AC 50/60Hz 208 / 230V AC 50/60Hz	16 / 3 x 2.5 (C type tripping character- istic)

4 Unpacking and installation

4.1 Unpacking



Warning! Risk of top-heavy unit falling over. Can cause equipment damage, personal injury or death. Read all of the following instructions before attempting to move, lift or remove packaging from the Knürr DCL.



Caution! Risk of sharp edges, splinters and exposed fasteners. Can cause personal injury. Only properly trained and qualified personnel wearing appropriate safety headgear, gloves, shoes and glasses should attempt to move, lift or remove packaging from the Knürr DCL or prepare the unit for installation.



Notice! Risk of overhead interference. Can cause unit and/or building damage. The unit may be too tall to fit through a doorway while on the pallet. Measure the unit and doorway heights and refer to the installation plans prior to moving the unit to verify clearances.



Notice! Risk of improper unit storage. Can cause unit damage. Keep the unit upright, indoors and protected from dampness, freezing temperatures and contact damage.



All the packaging material is recyclable. Please save this material for future use or dispose of it in accordance with local waste policy and laws.

After the Knürr DCL unit arrives and before it is unpacked, verify that the delivered equipment matches the bill of lading. Examine the packaging for any signs of mishandling or damage. Inspect all items for damage, visible or concealed. Report any damage immediately to the carrier and file a damage claim. Send a copy of the claim to Knürr or your Knürr representative.

Transport the packaged Knürr DCL using a forklift, pallet jack or a crane with slings and spreader bars that is rated for the weight of the unit. See table in chapter 3.3 for the unit weights.

- If using a fork lift or pallet jack make sure the forks (if adjustable) are spread to the widest possible distance that fits under the pallet. Make sure the fork length is suitable for the pallet length.
- When moving the packaged unit with a forklift or pallet jack, lift the unit from either end of the pallet.
- **WARNING.** Risk of improper handling or moving. Can cause equipment damage, injury or death. When handling the packaged Knürr DCL with a forklift or pallet jack, do not lift it any higher than 4" (102mm) off the floor. Any personnel not directly involved in lifting the unit must be at least 12 ft (3.7m) from the unit.

List of required tools

Phillips screwdriver PH3

Utility knife

Hexagonal socket screwdriver 8mm (Allen)

Open – jawed / ring wrench 8mm

Hexagonal key 6mm (Allen)

Wooden crate disassembly

- 1 Locate and remove all the bolts holding side walls of the crate together. Number of bolts can vary.
- 2 Take all the side panels of. Two people are required to do this.



Rolling the unit off the ramp

- 1 Use utility knife to cut the shrink wrap. Remove cardboard protectors.



- 2 Locate the ramp detach it and place it in the designated position.



1

- 1 Use the open – jawed / ring spanner to undo the bolts securing the unit to the pallet. (Please note that from this moment on the unit is not secured to the pallet and is prone to tilting)
- 2 Align the holes in the ramp to the holes in the pallet. Use 3 of the 4 bolts to secure the ramp to the pallet.
- 3 Remove the wedges.
- 4 Roll the unit off the pallet. Two people are required to do this.



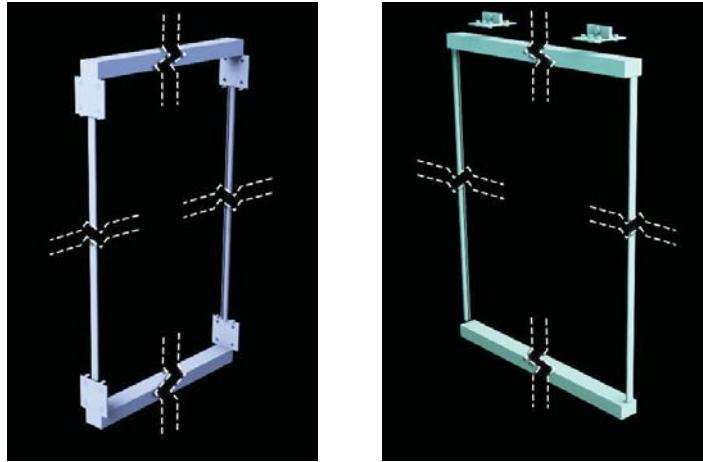
Unit positioning

- 1 Roll the unit into desired position.
- 2 Use 8mm open – jawed / ring spanner to detach stabilizer bar from brackets.
- 3 Use 8mm open – jawed / ring spanner to detach the brackets from unit frame.
- 4 Adjust leveling feet.



Built-in casters allow rolling the Knürr DCL into position for installation. Stabilizers reduce the likelihood of the unit tipping over. These stabilizers must be removed before the unit is positioned in the row (use hexagonal socket driver – 8 mm). Adjustable leveling feet prevent moving after positioning. Once positioned, the Knürr DCL must be secured either to the floor with the included shipping brackets or to an adjacent cabinet.

4.2 Securing brackets



Securing brackets for DCL and DCM

DCL and the added-on server cabinet or cabinets are bolted with each other by means of the connecting set in order to reach the required stability. Available securing brackets are shown in chapter 11.3.

4.3 Chilled water connection



Notice! Risk of water leakage. Can cause severe property damage and loss of critical data centre equipment. This unit requires a water drain connection. Improper installation, application and service practices can result in water leakage from the unit. Do not locate the Knürr DCL directly above any equipment that could sustain water damage. Emerson recommends installing leak detection equipment for the unit and supply lines.



NOTICE. Risk of corrosion. Can cause equipment damage.

Read and follow individual unit installation instructions for precautions regarding fluid system design, material selection and use of field-provided devices. Knürr systems contain iron and copper alloys that require appropriate corrosion protection.

Contact a local water consultant regarding water quality, corrosion and freeze protection requirements and follow their recommendations for monitoring and treatment of the water/coolant fluid.



Water chemistry varies greatly by location, as do the required additives, called inhibitors that reduce the corrosive effect of the fluids on the piping systems and components. The chemistry of the water used must be considered, because water from some sources may contain corrosive elements that reduce the effectiveness of the inhibited formulation.

Preferably, chilled waters that are classified as soft and are low in chloride and sulfate ion content should be employed. Proper inhibitor maintenance must be performed in order to prevent corrosion of the system. Consult glycol manufacturer for testing and maintenance of inhibitors. Commercial ethylene glycol (Union Carbide Ucartherm, Dow Chemical Dowtherm SR-1 and Texaco E.G. Heat Transfer Fluid 100), when pure, is generally less corrosive to the common metals of construction than water itself. It will, however, assume the corrosivity of the water from which it is prepared and may become increasingly corrosive with use if not properly inhibited.

All the control and measuring armatures are installed within the Knürr DCL. Their connection is made about 10 - 20 cm above the bottom (or at the top) of the Knürr DCL. By closing the internal ball valve the configuration can be changed from 3 - way valve to 2 - way valve.

Field-installed piping must be installed in accordance with local codes and must be properly assembled, supported, isolated and insulated. All piping below the elevated floor must be arranged so that it offers the least resistance to airflow. Careful planning of the piping layout under the raised floor is required to prevent the airflow from being blocked. When installing piping on the subfloor. Knürr recommends installing the pipes in a horizontal plane rather than stacked one above the other. Whenever possible, the pipes should be run parallel to the airflow.

Condensate Piping—Field-Installed

- Do not expose drain line to freezing temperatures
- Drain line must comply with local building codes
- Emerson recommends installing under-floor leak detection equipment

Requirements of Systems Using Water or Glycol

These guidelines apply to the field leak checking and fluid requirements for field piping systems, including Knürr chilled water circuits.

General Guidelines

- Equipment damage and personal injury can result from improper piping installation, leak checking, fluid chemistry and fluid maintenance.
- Follow local piping codes, safety codes.
- Qualified personnel must install and inspect system piping.
- Contact a local water consultant regarding water quality, corrosion protection and freeze protection requirements.
- Install manual shut-off valves at the supply and return line to each indoor unit to permit routine service and emergency isolation of the unit.



NOTICE

Risk of no-flow condition. Can cause equipment damage.
Idle fluid allows the collection of sediment that prevents the formation of a protective oxide layer on the inside of tubes. Keep unit switched ON and system pump operating



NOTICE

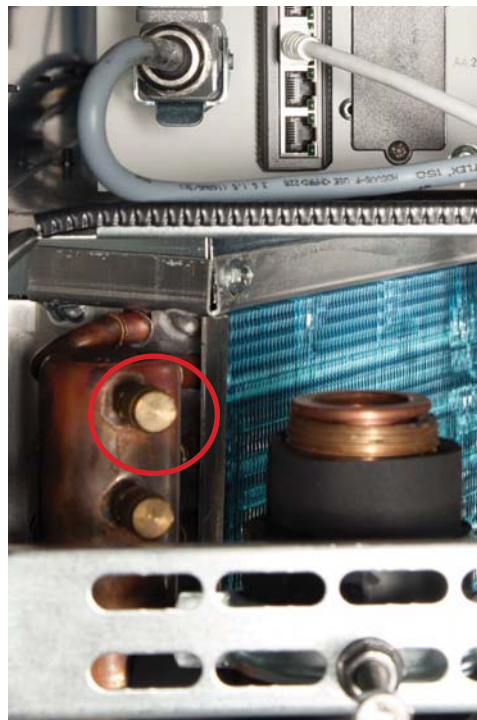
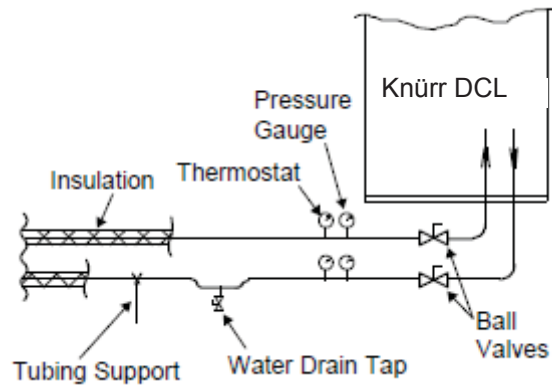
Flexible pipe connection
When using top CW connection please consider using flexible pipes. We recommend using flexible pipes to reduce strain to the roof panels.

Notes for Closed-Circuit Applications

The installation in picture below is illustrative only; for individual installations follow the project diagram.

- Install a pump system calculated on the basis of the flow and total head of the system (see site plan data)
- Insulate both pipes.
- Very important: Add ethylene glycol to the circuit when the ambient temperature is below 32°F (0°C); refer to the Knürr DCL technical data manual, SL-11978, Page 65). Do not exceed the nominal operating pressure of the circuit components.
- Bleed air out of the circuit. It is recommended to use a hose for bleeding the system because there is a risk of water being sprayed over the optional A/B transfer switch or other electronic appliances located in the vicinity. Gravity Drain—Units Without Factory-Installed Condensate Pump

- 3/4" FPT drain connection is provided on units without optional factory-installed condensate pump
- Pitch the drain line toward the drain at minimum of 1/8" (3mm) per 1 foot (305mm) of length (1%)
- Drain is trapped internally. Do not trap the drain external to equipment
- Drain line must be sized for 2 gpm (7.6 l/min) flow

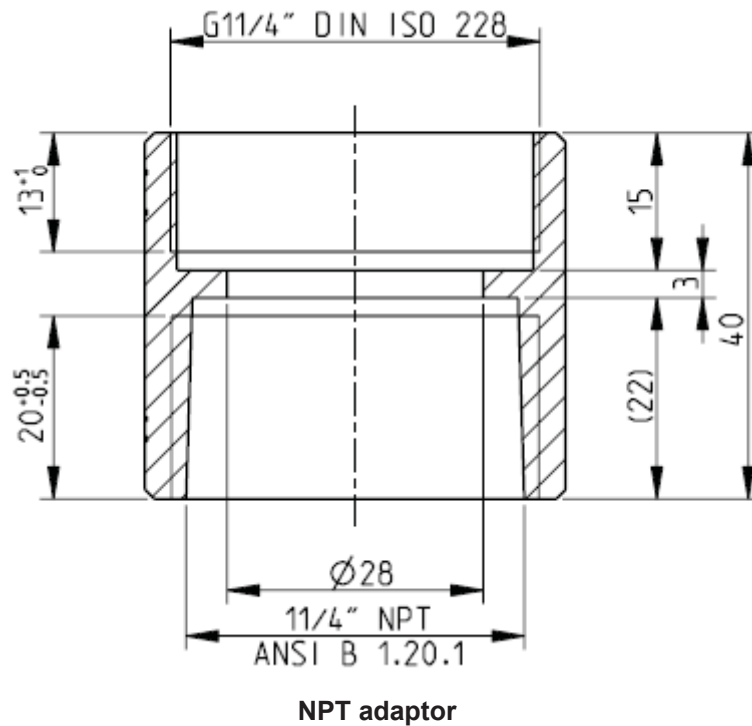


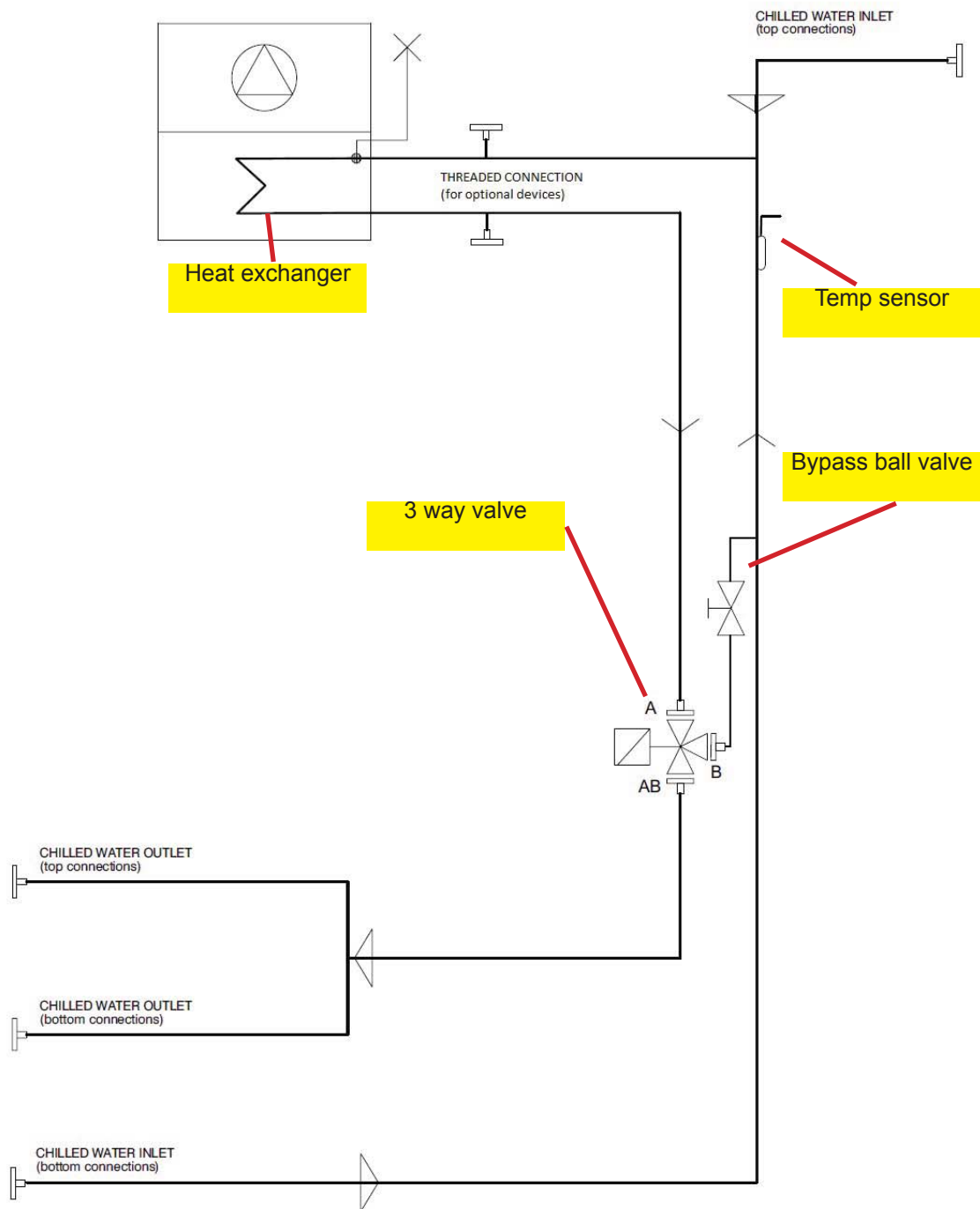
Bleeding point location

To prevent condensate build up on the water connection pipes cover them with appropriate insulation.
Insulation thickness: "F" (9-12mm) at $\lambda = 0.037 \text{ W.m-1.K-1}$ (10°C)

National pipe thread conversion kit (for USA use only)

In case on site piping provides national pipe thread (NPT) it is possible to connect the unit using optional conversion kit. Conversion kit consists of pipe adaptor and sealing material. NPT site is to be sealed with Teflon tape and the ISO 228 site with flat sealing.





Hydraulic schematic

4.4 Control

The main task of the control is to provide constant temperature conditions to the installations in the server cabinet at varying loads as well as to run the supporting system in an energy-saving mode.

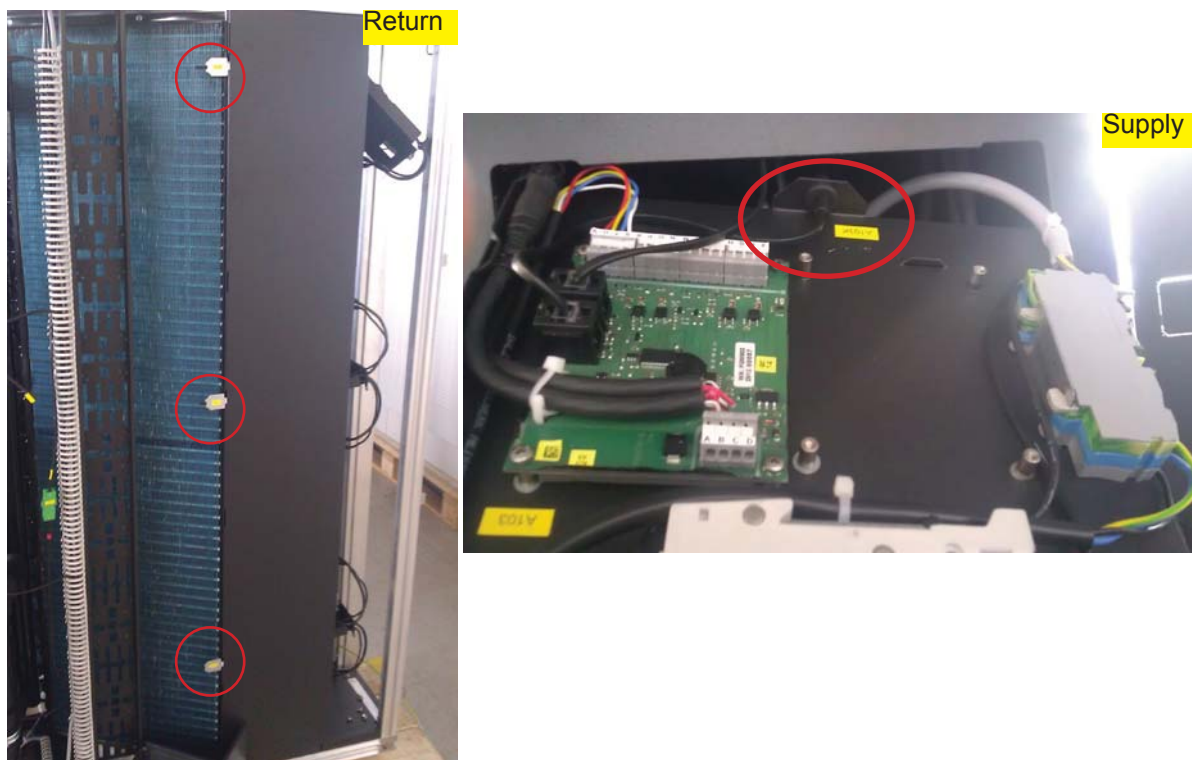
Another task is the comprehensive visualization and transfer of monitored parameter with process decisions derived to guarantee availability; everything with view of data exchange and access via the network.

A series of control and monitoring options complements the basic concept for all applications that occur and that are to be safeguarded.

Temperature is controlled depending on the inside temperature in the server cabinet.

Fan control

Fan speed is controlled by air temperature sensors (3 supply sensors or 3 return sensors). Air temperature is constantly monitored and fan speed is adjusted accordingly to provide sufficient amount of cooling air. Any sensor can be selected as a control sensor. Fan speed can also be set manually or automatically. Minimum fan speed is 25%. For closed loop units (DCL - L and DCL - H) there is a bypass pipe with temperature sensor running from back to front. This solution allows indirect monitoring of pressure difference and accurate fan speed adjustment to provide sufficient amount of cooling air.

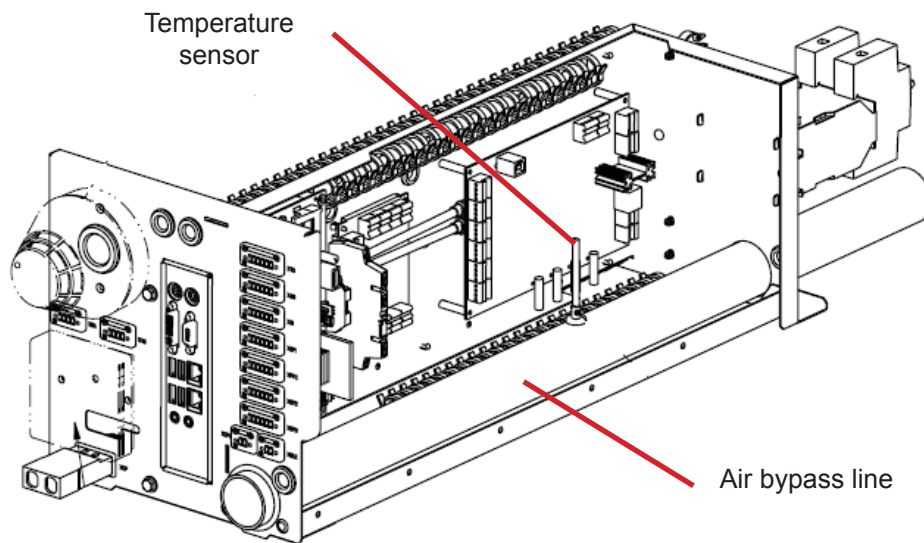


Return and supply temperature sensors location

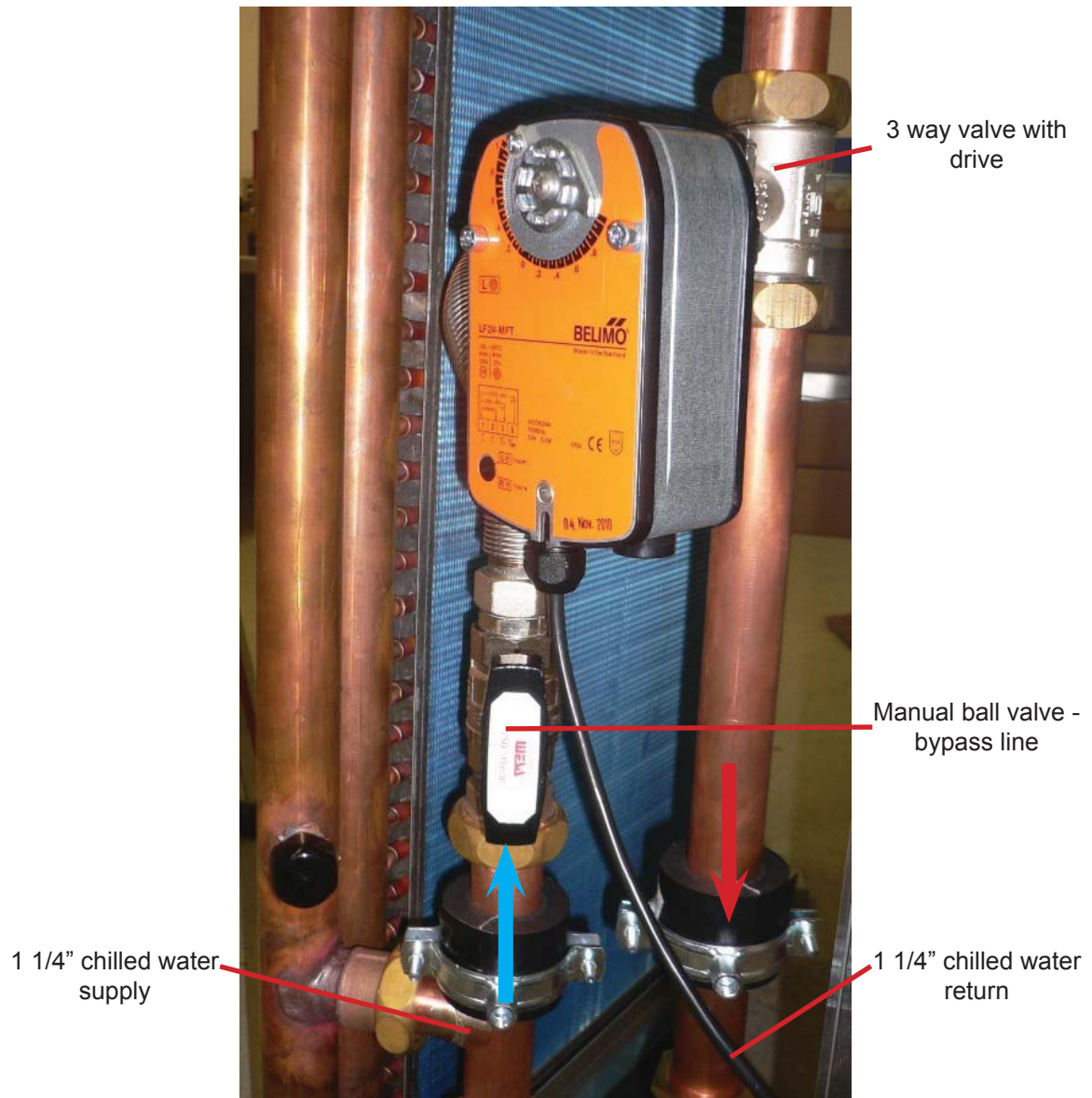
Cooling capacity control

A three-way or two-way valve (manually adjustable) adjusts the chilled water flow to modify cooling capacity. This is to avoid low temperatures during a partial load operation.

In the event of failure, the valve will close and the entire volume flow will be run via the bypass. To keep desired temperature at the air supply side the valve controls the water flow between 0% and 100% of the designed flow rate (distribution and quantity control).



Bypass pipe location

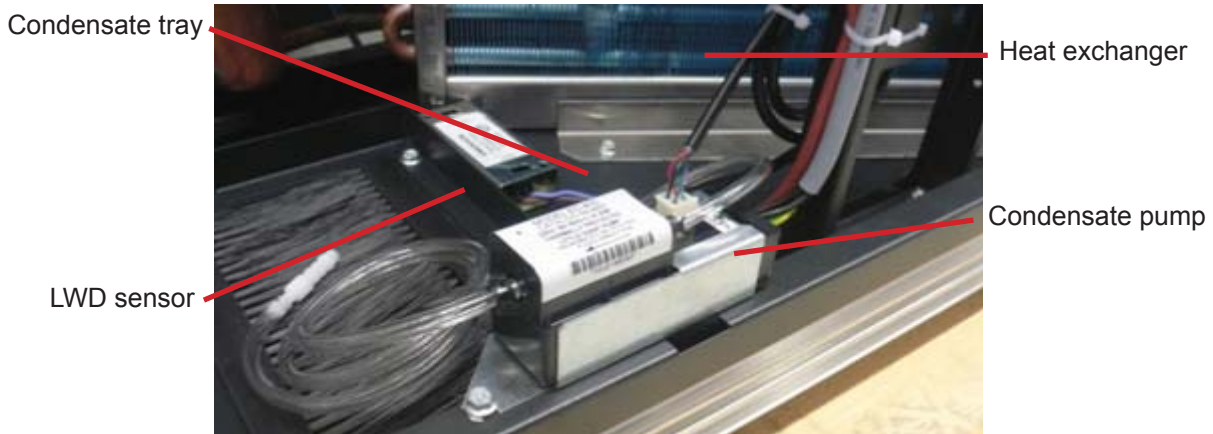


Chilled water system

4.5 Condensate drain connection

Condensation may occur during operation of the DCL unit. For draining such condensed water, a condensed water connection of a diameter of 5/8" is provided for in the condensed water tub as well as the condensate pump (optional).

When connecting the condensed water tube take care that the condensed water line is connected to a siphon trap with a non-return valve and self-filling and that the condensed water line is inclined. The level of installation of the respective siphon trap must be designed for negative or excess pressure, respectively, of 300 Pa so that sucking in air or releasing it from the sewage system is prevented. Condensed water is drained de-pressurized or optionally by means of condensate water pump.



Condensate management system



Actual condensate pump location

Pump performance			
Head (ft)	Flow (GPH)	Head (m)	Flow (LPH)
1	2.5	0.3	9.5
5	1.5	1.5	5.7
10	1	3.0	3.8
15	0.7	4.6	2.6
20	.6	6.1	2.3

* To ensure proper condensate drainage, please keep the unit level or biased to the front side slightly.

4.6 Electrical connection



WARNING. Risk of arc flash and electric shock. Can cause injury or death. Disconnect all local and remote electric power supplies and wear appropriate personal protective equipment per NFPA 70E before working within. Therefore, take the cabinet out of operation prior to assembly and secure it against unauthorized re-connection.



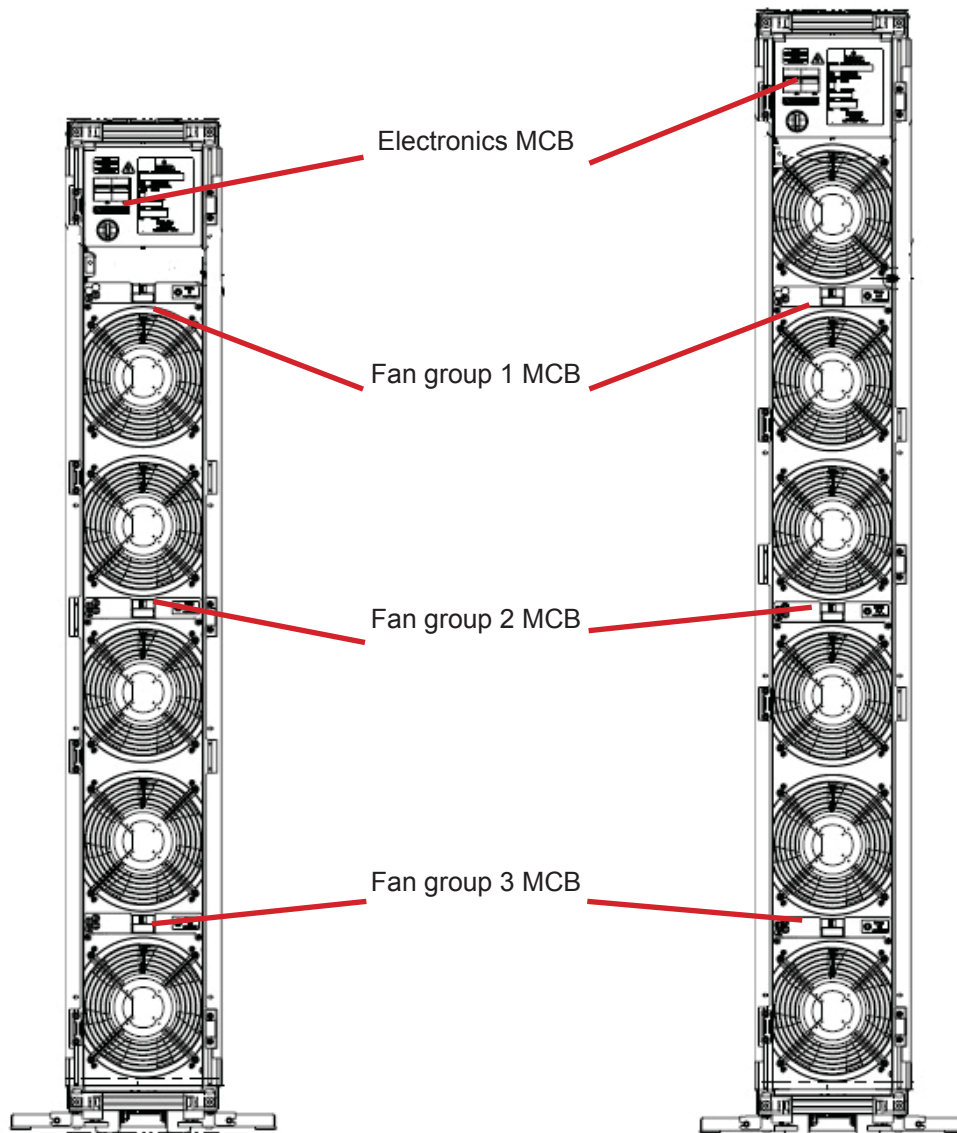
The device must only be connected electrically by authorized personnel (electrically skilled staff). Thereby, the personnel must make sure that during such connecting works the cabinet remains free from voltage and is secured against being switched ON by unauthorized parties. Internal sockets can be used only by authorized persons.



As soon as all precautions for assembly have been taken, you may start to install the electrical connection.

Check whether the voltage and frequency as provided by the customer as well as the size of pre-fusing correspond with the specifications on the nameplate.

The connection to the power supply will be effected via a connection line to be provided and which is to be connected to the terminal board.



Electrical connections

For connection of the device to power

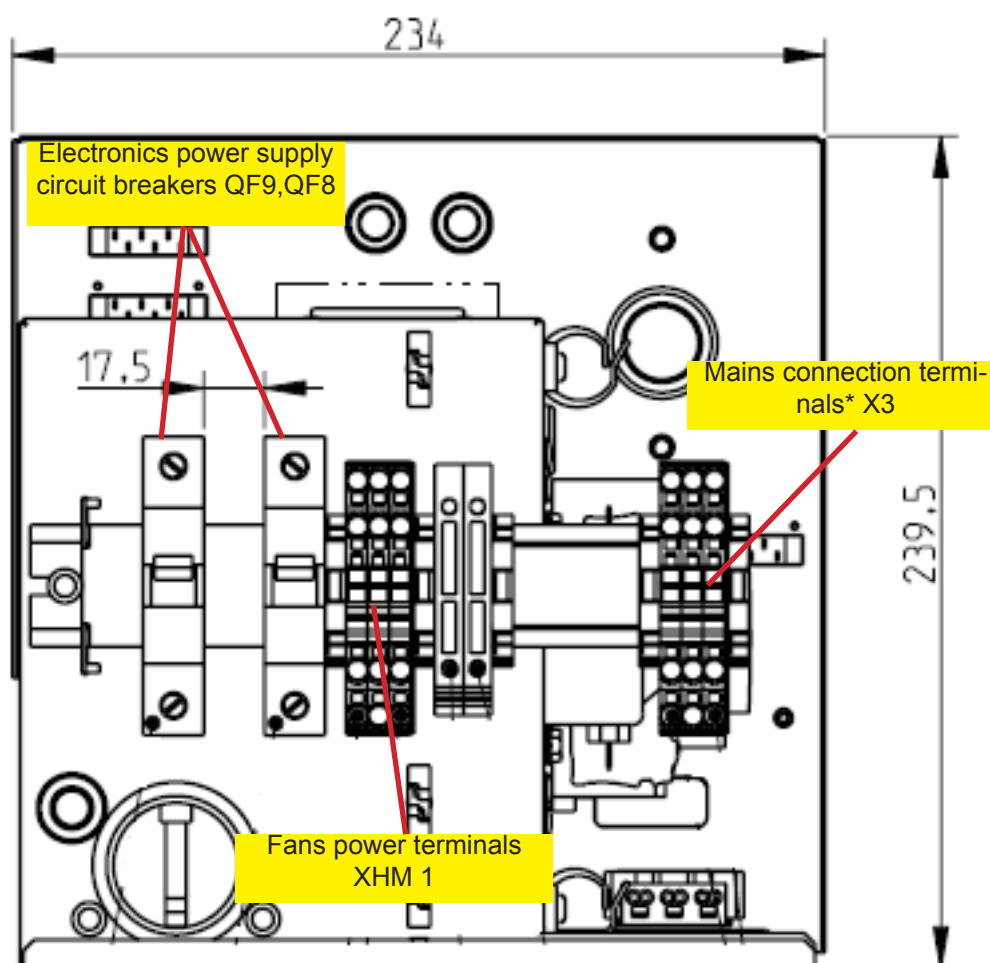
- Switch off main switch
- Derive the connection scheme from the power flow diagram
- Connect the line to the IT network
- Check for safe grounding connection



Put the DCL into operation again in accordance with instructions
Switch all automatic safety cut outs ON
The device fans start turning clock-wise



Warning! Risk of electric shock. Can cause injury or death. This unit has high leakage current potential. Proper earth ground connection per national and local codes is required before connection to the electric power supply.
Change of lithium battery belongs only to the manufacturer; the battery is soldered to the control PCB, caution risk of explosion

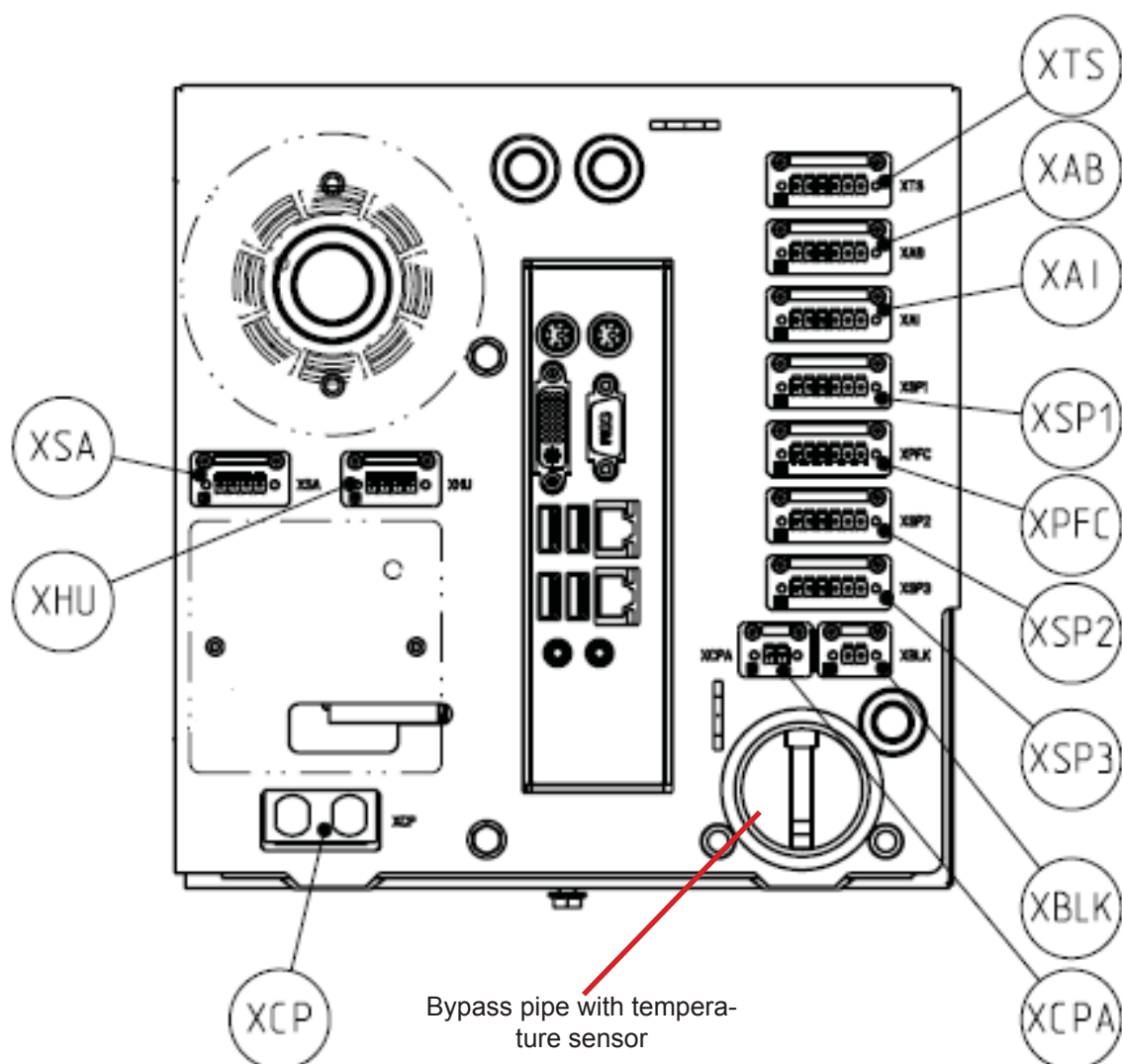


Electrical connections terminals

* In case your unit is equipped with optional AB transfer switch these terminals come pre connected. Your connection point is then the AB transfer switch at the back of the unit. (Terminals X1 and X2 - see chapter 5.2)

	EU version 230 V / 50 Hz	US version 208/230 V / 60Hz
Electronics circuit breaker	ABB S201-C6 Number of Poles: 1 Tripping Characteristic: C Rated Current (I_n): 6.00 A Rated Operational Voltage (U_e): 230 V AC Rated Short-Circuit Capacity (I_{cn}): 6.0 kA Degree of Protection: IP20	ABB S202-C6 Number of Poles: 2 Tripping Characteristic: C Rated Current (I_n): 6.00 A Rated Operational Voltage (U_e): 208/230 V AC Rated Short-Circuit Capacity (I_{cn}): 6.0 kA Degree of Protection: IP20
Fan circuit breakers	3 x ABB S201-C6 Number of Poles: 1 Tripping Characteristic: C Rated Current (I_n): 6.00 A Rated Operational Voltage (U_e): 230 V AC Rated Short-Circuit Capacity (I_{cn}): 6.0 kA Degree of Protection: IP20	3 x ABB S202-C6 Number of Poles: 2 Tripping Characteristic: C Rated Current (I_n): 6.00 A Rated Operational Voltage (U_e): 208/230 V AC Rated Short-Circuit Capacity (I_{cn}): 6.0 kA Degree of Protection: IP20

Circuit breakers



Electronics connection terminals

* description of the connectors is shown in the annex

Put the Knürr DCL into operation again in accordance with instructions.
Switch the main switch on
Switch all automatic safety cutouts ON.
The device fans start turning clock-wise.



This device has no own switch to mains, the switch must be installed in the building electrical network. Please use a protect switch 16 A according to the wiring scheme. (EN 60950-1, 3.4.3)

Typical EU voltage levels
Typical USA voltage levels
Nominal current (30kW/34kW)
Short circuit current rating

230 V AC (1ph – 50Hz)
208/230 V AC (1ph – 60Hz)
9,1 A / 10 A
6 kA

4.7 Sealing the housing

The air-tightness of the housing corresponds with RAL 652.

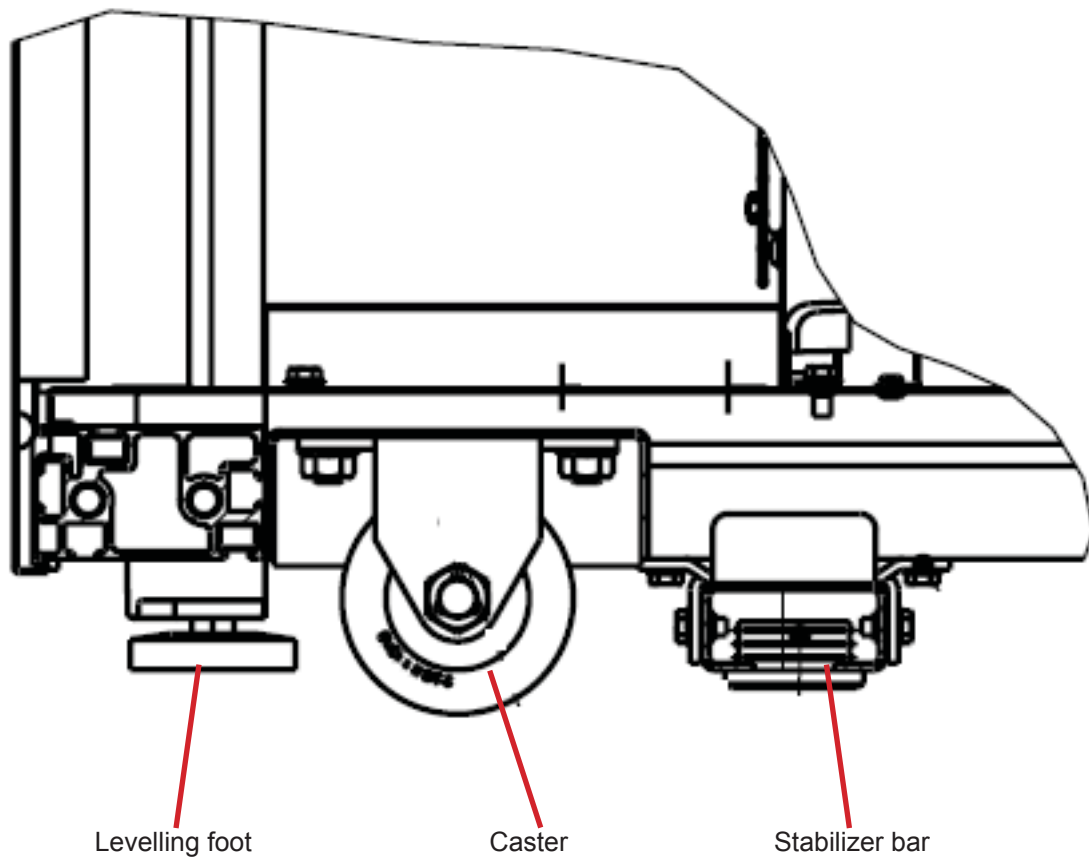
In order to guarantee optimum cooling performance, the housing must be sealed as follows:

- Cut pipe duct into the foam, seal it expertly with foam panel material.
- Seal cable bushings by foaming.
- Keep air carefully separated between the cold and warm sides of the Knürr DCL and the server cabinet.

5 Options

5.1 *Caster bracket*

Unit can be ordered with optional caster bracket which allows unit to be moved around installation area easily. Castor equipped unit also comes with stabilizer bar to prevent top heavy unit from toppling. In case the unit has been ordered with casters there is no longer a possibility of fitting 2 units on one pallet.



Servicing and maintenance work is to be performed by correctly trained personnel only and in accordance with applicable regulations as well as manufacturers' specifications!

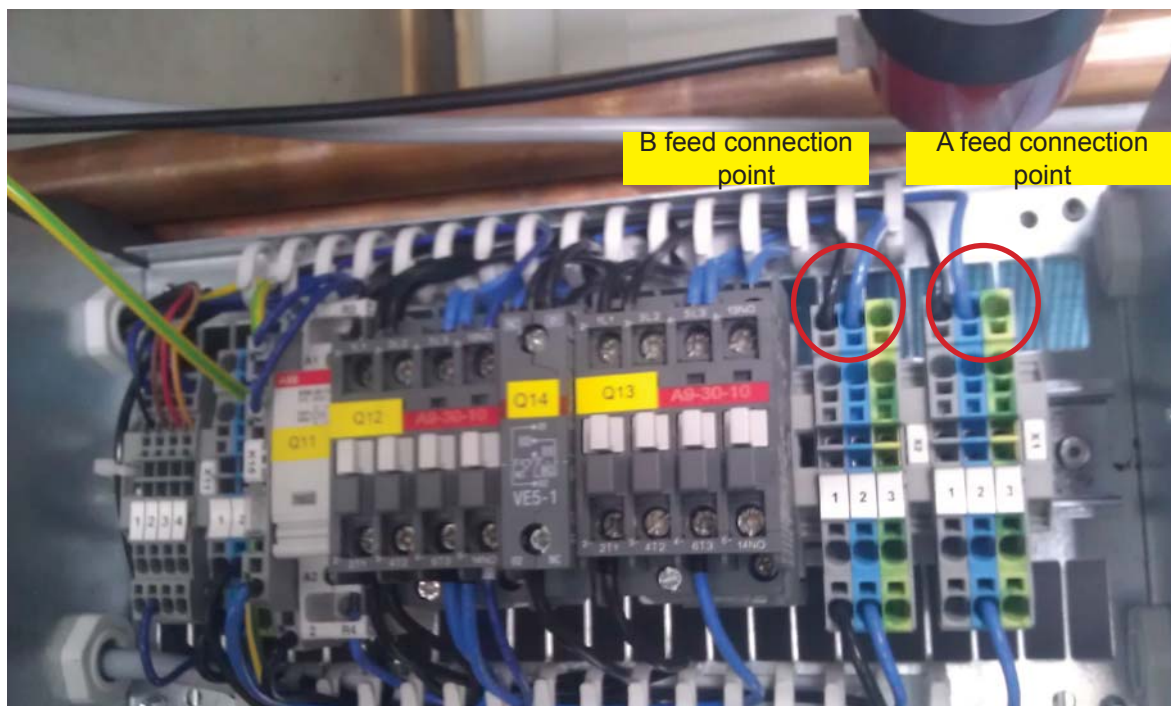
5.2 AB transfer switch

The A+B change over circuit offers the possibility to supply the CRV – DCL control equipment and fans from two independent mains supplies. The switch operation is automatic. The switch is located in the back of the unit.

There are two cables to connect the CRV- DCL to the external mains. These cables are connected to the cabinets internal circuit by the terminal X (X1:1 = phase, X1:2 = neutral , X1:3 = PE for mains A and X2:1 = phase, X2:3 = neutral , X2:4 = PE for mains B).

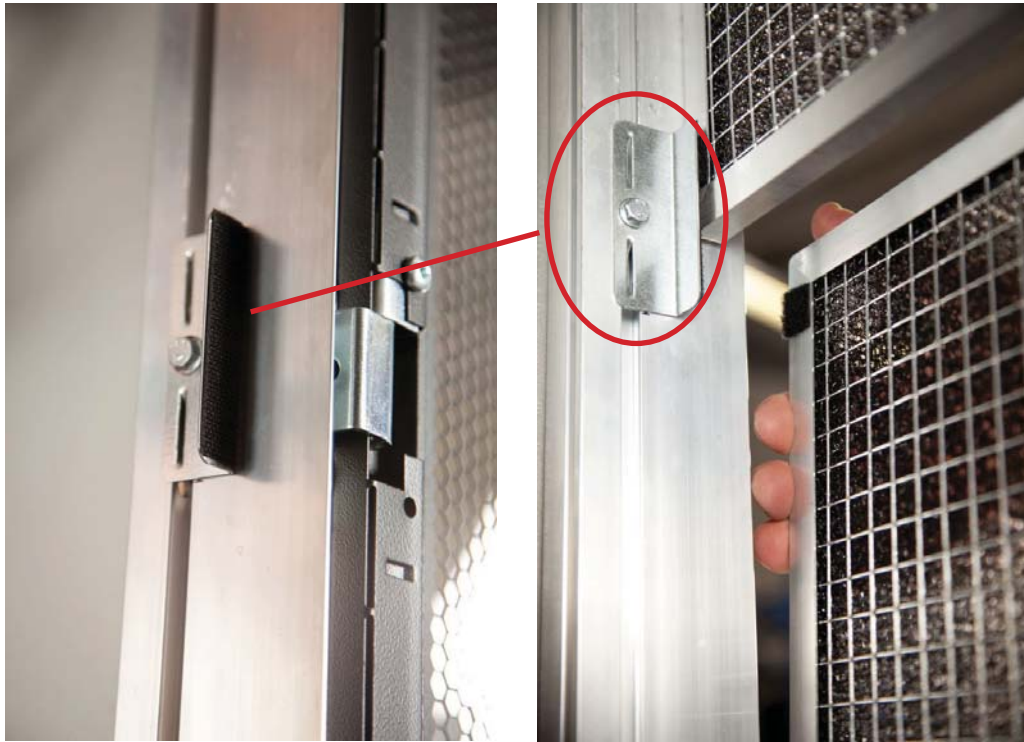
Please pay attention to the recommended external fuse. The change over circuit itself consists of the contactors Q11 to Q14. Q11 is an auxiliary contactor an presets the circuit to supply from mains A (if the both mains supplies are powered up). Only in the case at mains A power is off the circuit switches automatically to mains B. When powering up mains A again the circuit switches automatically back to mains A.

The change over time is about 10 milliseconds .The interruption causes no alarm signal “power failure “. It only shows witch feed is powering the unit. The main contactors Q12 and Q13 are mechanical coupled by part Q14 (new version without Q14), which ensures that only one of the main contactors is closed. The phase and the neutral wires are switched. All internal equipment is connected at the output of the A+B change over circuit. That means fans, fan control unit or RMS have a redundant supply.



5.3 Filter

G1 class air filter is available to provide air purification. Additionally the unit can be equipped with filter clog switch to detect dirty filters, which need changing. Filter is mounted in the back of the unit on metal brackets (see pictures).

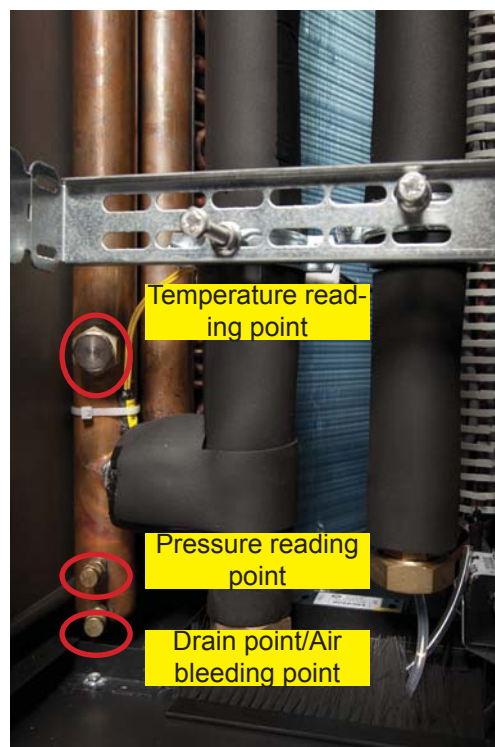


5.4 Chilled water monitoring

To manage chilled water system including condensation which can occur the unit can be equipped with several devices.

- temperature sensors
- flow meter (pressure difference)
- condensate pump

Pipework of the DCL unit is equipped with flanges that allow connection of additional equipment. There are two flanges on the pipe before the heat exchanger and two on the pipe after the exchanger. These are intended for bleeding and pressure measurements. There are also two ports (one before and one after the heat exchanger) for measuring temperature.



Pressure difference gives you value for chilled water flow and combined with chilled water temperature difference the cooling capacity will be calculated. This is based on calorific formula. All sensors come prewired. Obtained information are shown on the display (or in the web interface). Pressure difference sensor is attached to the aluminium frame in the back of the unit (See picture below).

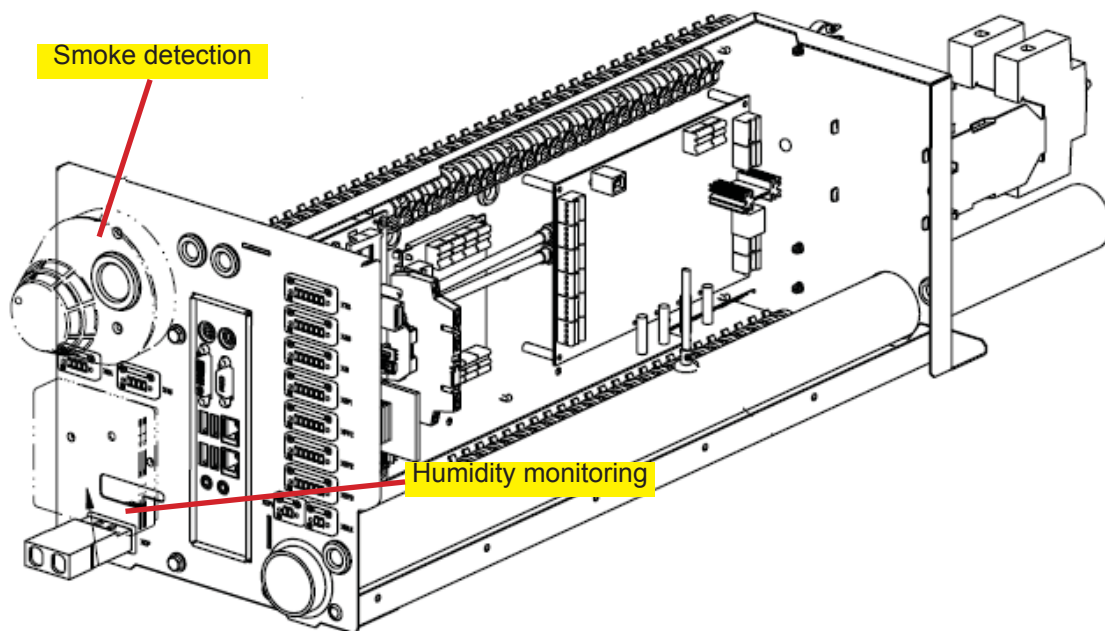


Pressure difference sensor

Condensed water pump is described in chapter 4.5.

5.5 Environment monitoring

For monitoring ambient air the unit can be ordered with smoke detection sensor (optical) and humidity monitoring sensor. Sensors are located at the back of the electronics box in the rear of the unit (on the return air side). Obtained values are displayed on the display and/or in the web interface.



Environment monitoring

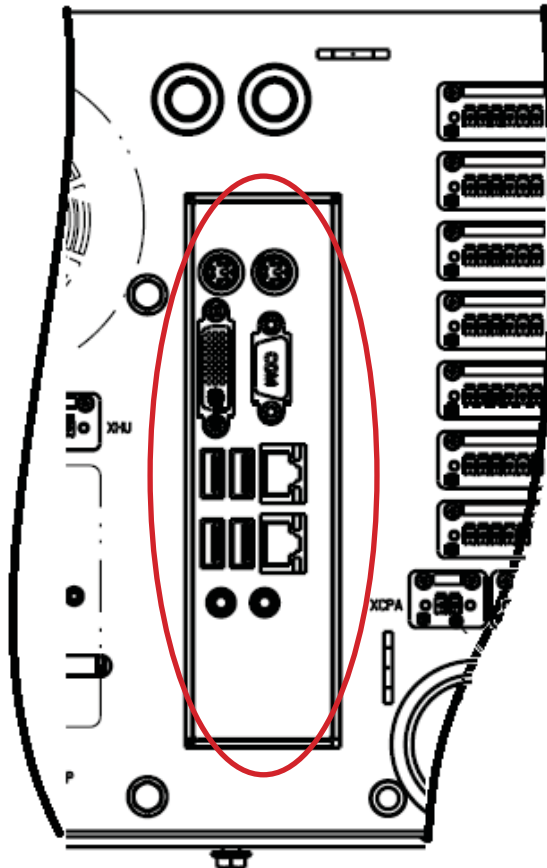
5.6 Communication

Various different communication protocols are available.

- TCP/IP - standard, always present (SNMP up to V3, HTTP and HTTPS)
- 4 Digital I/O for customer specific application
- Modbus RTU

... and their combinations (See unit configuration number)

Ports are accessible from the rear.



Communication connection

5.7 Server rack monitoring

As the unit is based on same platform as DCM racks and is intended to be used alongside such racks there are options available for adjacent racks. See unit configuration number digit 20.

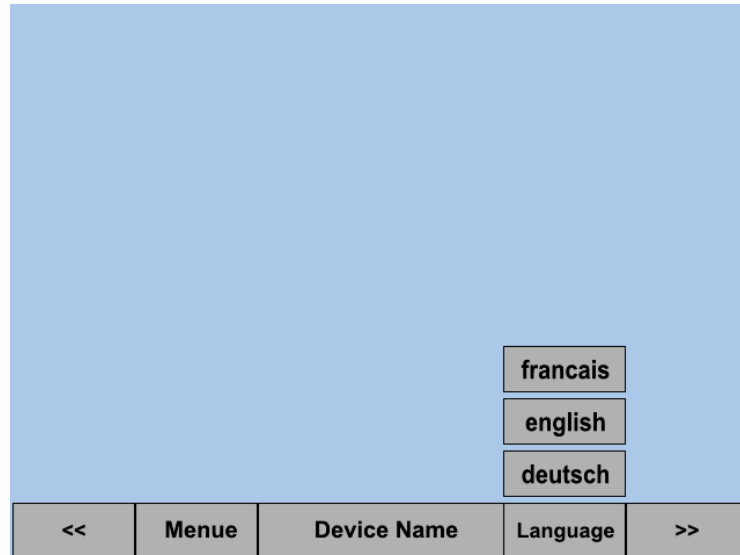
- Door contacts
- Temperature sensors

Status of present and connected sensors is then shown on the display and/or in the web monitoring interface (See chapter 6)

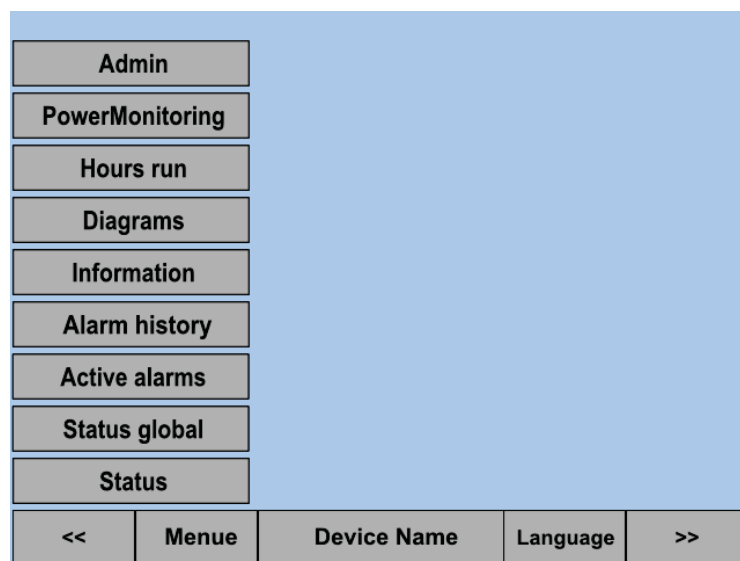
6 User interface

6.1 Display screens

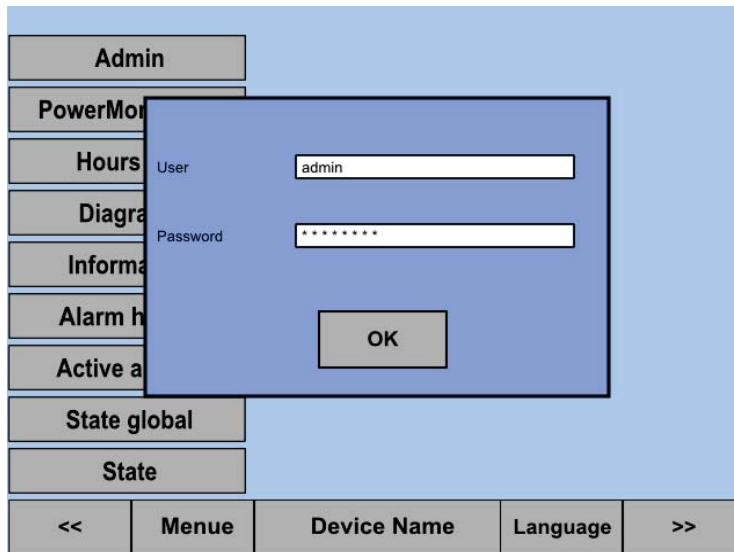
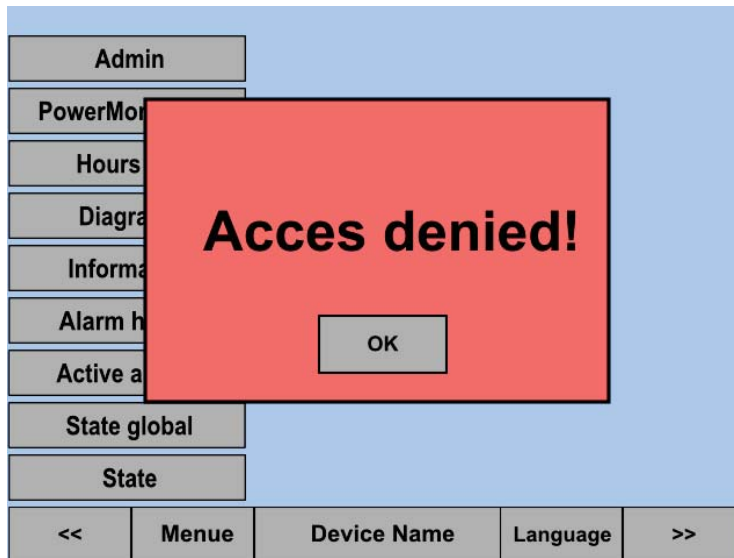
Unit display is color touch operated display. To select desired item just press the button wit your finger. Three languages are currently available.



After language choice you can proceed to Menu. User menus provide basic overview of the unit operation.



To proceed to higher levels (Admin, Service, Factory) you have select desired level from the touch menu and insert correct user name and password. Using incorrect user name and/or password will cause error message to appear.

For user there are some basic screens available. See pictures bellow.


Hours run	Gives you information about running hours for each of the fans for the ease of maintenance.
Diagrams	Graphical representation of temperatures etc.
Information	Displays information about controller and firmware version.
Alarm history	Shows information about past alarms including duration.
Active alarms	Displays currently active alarms.
State global	Gives information about all cooling units in the network
State	Displays multiple pages about current unit and it's remote sensors (if present). To navigate through the pages press left and right arrows.

Active Alarms				
active since	Alarm			
2011-06-08 15:45:00	water sensor			
2011-06-08 15:35:00	fan 3			
2011-06-08 15:30:00	supply air temperature			

<<	Menue	Device Name	Language	>>
----	-------	-------------	----------	----









Status Global					
device	mode	status	supply air	return air	cooling capacity
NAME-DEVICE-1-ABCDEFGHKL	ON	✓	21°C	41°C	33kW
NAME-DEVICE-2	ON	✓	21°C	41°C	33kW
NAME-DEVICE-3	ON	✓	21°C	41°C	33kW
NAME-DEVICE-4	ON	⚠	21°C	41°C	33kW
NAME-DEVICE-5	ON	⚠	21°C	41°C	33kW
NAME-DEVICE-6	ON	✓	21°C	41°C	33kW
NAME-DEVICE-7	STANDBY	✓	21°C	41°C	33kW
NAME-DEVICE-8	OFF	✓	21°C	41°C	33kW

<<	Menue	Device Name	Language	>>
----	-------	-------------	----------	----

Status			
Cooling Capacity 30kW			
Return Air	Fan	Supply Air	
34.5°C	75% ➡	20°C	
35.1°C	89% ➡	➡	
34.9°C	81% ➡	45%RH	
➡ Return Water		Flow Rate	
A 18,1°C		A 3.5m³/h	
B 18,0°C		B 3.6m³/h	
		➡ Supply Water	
		A 13,2°C	
		B 13,1°C	

<<	Menue	Device Name	Language	>>
----	-------	-------------	----------	----

Status 1

Sensor 1 24°C Sensor 2 24°C Sensor 3 24°C Sensor 4 24°C Sensor 5 24°C Sensor 6 24°C	Fan 100% Return Air 35°C  Cooling Capacity 30kW Return Water 18,1°C 18,0°C 1  2	ON     	Valve 100% Supply Air 20°C  45%RH Flow Rate 1 3.5m³/h 2 3.6m³/h	Sensor 1 24°C Sensor 2 24°C Sensor 3 24°C Sensor 4 24°C Sensor 5 24°C Sensor 6 24°C
--	--	--	---	--

<<	Menue	Device Name	Language	>>
----	-------	-------------	----------	----

Time Setting

day	<input type="text" value="11"/>
month	<input type="text" value="5"/>
year	<input type="text" value="2011"/>
hour	<input type="text" value="15"/>
minute	<input type="text" value="30"/>
second	<input type="text" value="59"/>

<<	Menue	Device Name	Language	>>
----	-------	-------------	----------	----

User

	username	password		
user 1	<input type="text" value="user"/>	<input type="password" value="*****"/>	<input type="text" value="user"/> ▼	<input type="button" value="create"/>
user 2	<input type="text" value="admin"/>	<input type="password" value="*****"/>	<input type="text" value="admin"/> ▼	<input type="button" value="create"/>
user 3	<input type="text"/>	<input type="password"/>	<input type="text" value="service"/> ▼	<input type="button" value="create"/>
user 4	<input type="text"/>	<input type="password"/>	<input type="text" value="user"/> ▼	<input type="button" value="create"/>
user 5	<input type="text"/>	<input type="password"/>	<input type="text" value="user"/> ▼	<input type="button" value="create"/>

user

▼

<<	Menue	Device Name	Language	>>
----	-------	-------------	----------	----

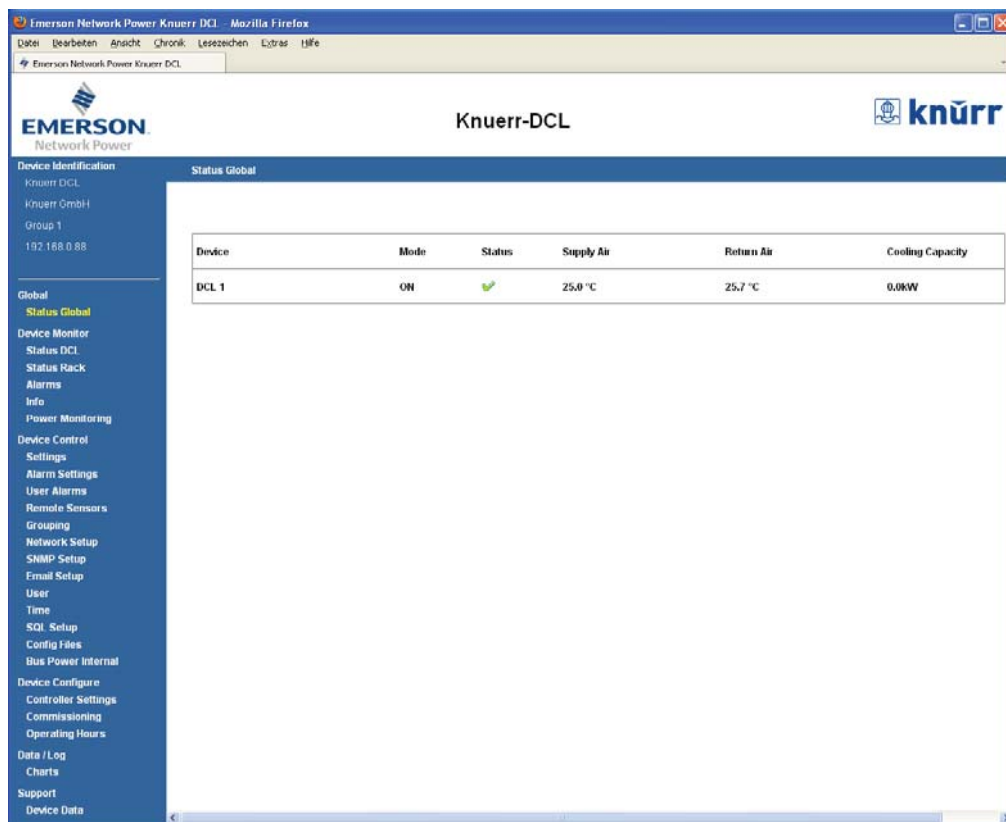
Network Setup				
LAN 1	LAN 2			
Bridge <input type="checkbox"/>				
DHCP <input type="checkbox"/>	DHCP <input type="checkbox"/>			
fix IP <input checked="" type="checkbox"/>	fix IP <input checked="" type="checkbox"/>			
IP address <input type="text" value="1.1.199.88"/>	IP address <input type="text" value="192.168.0.88"/>			
Subnet <input type="text" value="255.255.255.0"/>	Subnet <input type="text" value="255.255.255.0"/>			
DNS <input type="text" value="0.0.0.0"/>	Gateway <input type="text" value="0.0.0.0"/>			
DNS <input type="text" value="0.0.0.0"/>	DNS <input type="text" value="0.0.0.0"/>			
<input type="button" value="save"/>				
<<	Menue	Device Name	Language	>>

6.2 Web interface

The CoolCon control serves the control of air conditioning and the monitoring of the Knürr DCL and the server cabinets attached to it. It is a modularly expandable monitoring and control system. The basic variant enables the monitoring of up to four fan racks, a leakage sensor, temperature sensors for supply and return air as well as air conditioning of the cabinet. Thereby, the chilled water quantity is adjusted to the required cooling by means of a control valve; the fan speed is likewise variable.

A 10/100MBit Ethernet connection is available for communication to support TCP/IP, HTTP(S), FTP, SNMP (up to V3) and NTP protocols. It is configured and monitored via an integrated Web server, an FTP server as well as an SNMP agent.

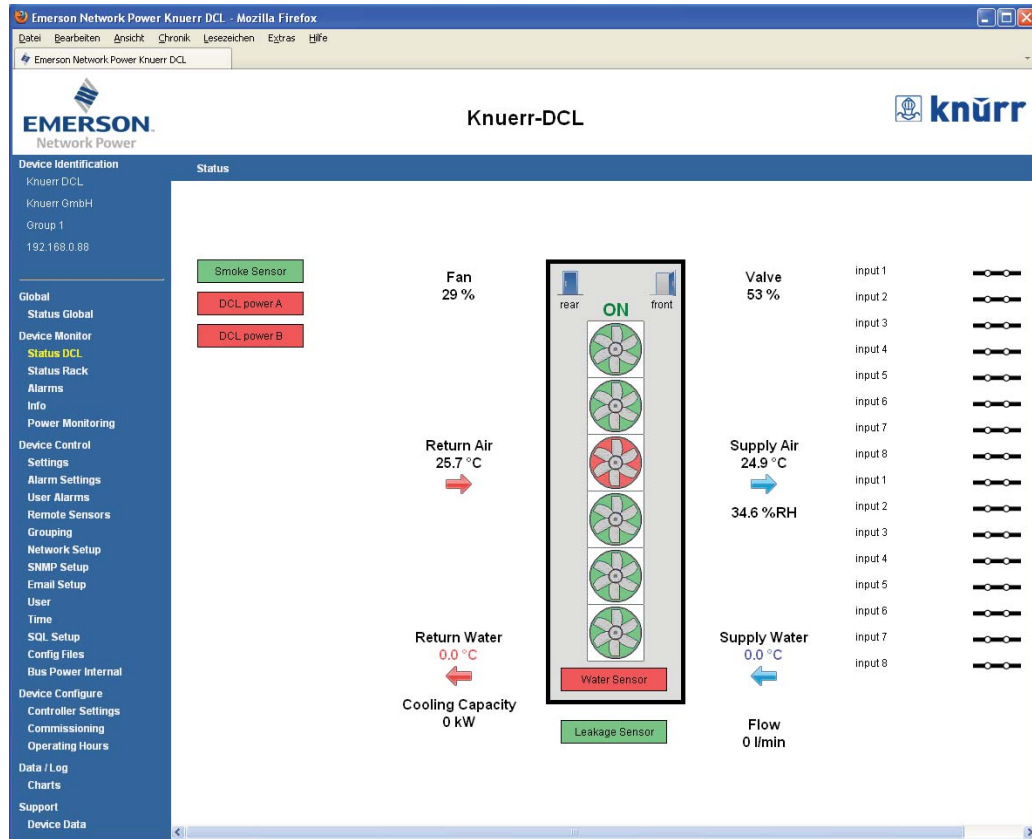
User section



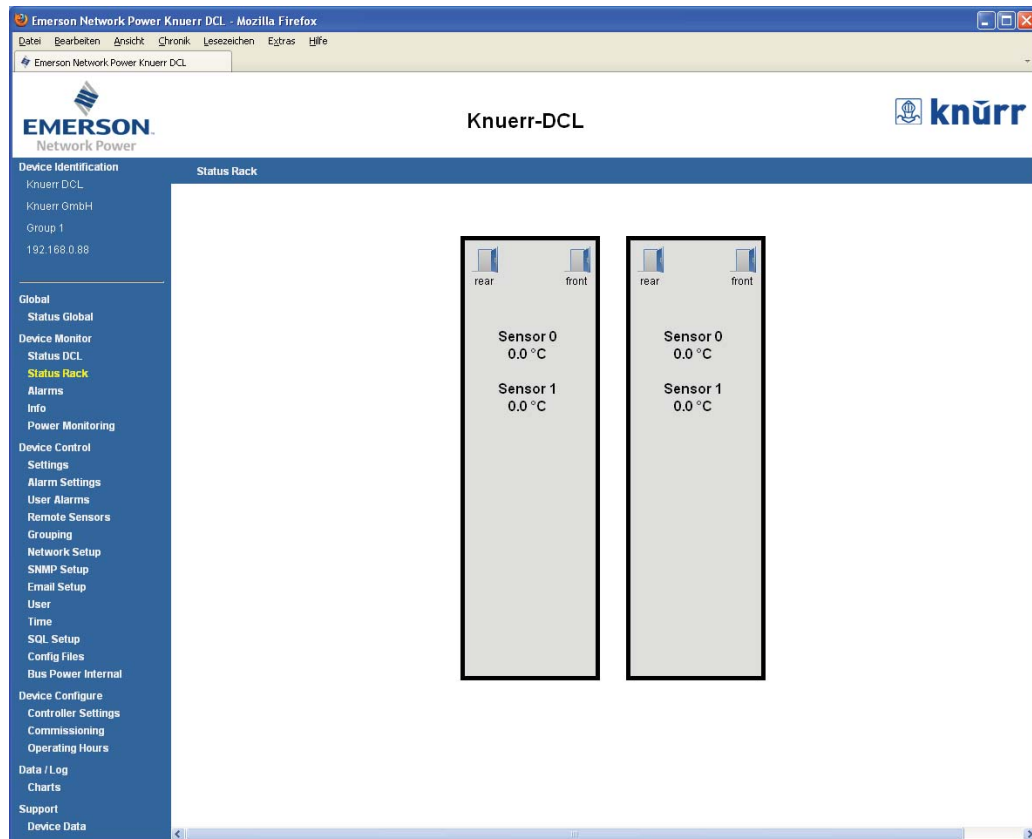
The screenshot shows the web interface for the Emerson Network Power Knürr DCL. The browser window title is "Emerson Network Power Knürr DCL - Mozilla Firefox". The page header includes the Emerson Network Power logo and the Knürr logo. The main content area is titled "Status Global" and displays a table with the following data:

Device	Mode	Status	Supply Air	Return Air	Cooling Capacity
DCL 1	ON	✓	25.0 °C	25.7 °C	0.0kW

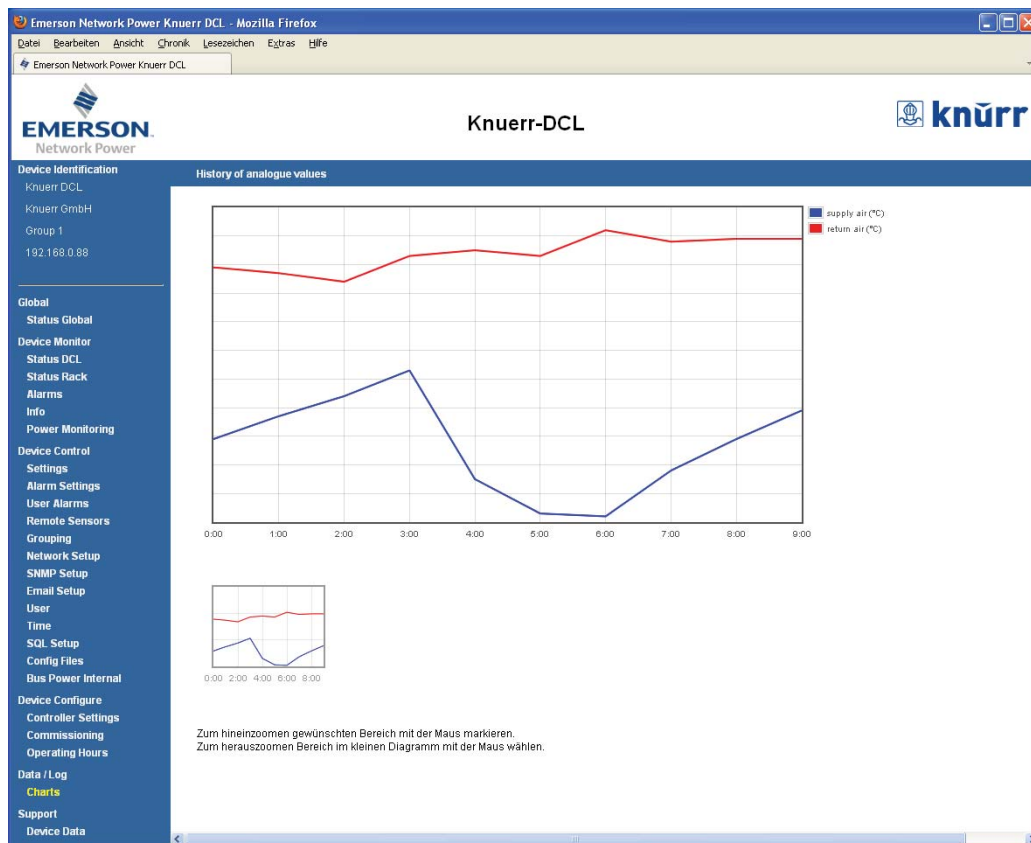
Global status



Unit status



Status check



Data logging

Emerson Network Power Knuerr DCL - Mozilla Firefox

Emerson Network Power Knuerr DCL

Knuerr-DCL

Device Identification

- Knuerr DCL
- Knuerr GmbH
- Group 1
- 192.168.0.88

Global

- Status Global

Device Monitor

- Status DCL
- Status Rack
- Alarms
- Info
- Power Monitoring

Device Control

- Settings
- Alarm Settings
- User Alarms
- Remote Sensors
- Grouping
- Network Setup
- SNMP Setup
- Email Setup
- User
- Time
- SQL Setup
- Config Files
- Bus Power Internal

Device Configure

- Controller Settings
- Commissioning
- Operating Hours

Data / Log

- Charts

Support

- Device Data

System Information

Running Application	coolloop
Software Application Version	2.1.0
HMI Version	2.1.0
Hardware Platform	D2963-S1
Kernel Version	2.6.26-2-686

Manuals

- Ersatzteilliste - Spare Parts.pdf
- 01_998_334_0_b.pdf

Controller firmware info

Admin section

Emerson Network Power Knuerr DCL - Mozilla Firefox

Emerson Network Power Knuerr DCL

EMERSON Network Power **knürr**

Knuerr-DCL

Device Identification

Knuerr DCL
Knuerr GmbH
Group 1
192.168.0.88

Global
Status Global

Device Monitor
Status DCL
Status Rack
Alarms
Info
Power Monitoring

Device Control
Settings
Alarm Settings
User Alarms
Remote Sensors
Grouping
Network Setup
SNMP Setup
Email Setup
User
Time
SQL Setup
Config Files
Bus Power Internal

Device Configure
Controller Settings
Commissioning
Operating Hours

Data / Log
Charts
Support
Device Data

Settings

save

Return Air

set point	24.0 °C
lower temperature alarm	0.0 °C
upper temperature warning	43.0 °C
upper temperature alarm 1	45.0 °C
upper temperature alarm 2	50.0 °C
upper temperature alarm 3	60.0 °C

Supply Air

set point	20.0 °C
lower temperature alarm	5.0 °C
upper temperature warning	25.0 °C
upper temperature alarm 1	28.0 °C
upper temperature alarm 2 (door opening)	30.0 °C
upper temperature alarm 3 (server switch off)	35.0 °C

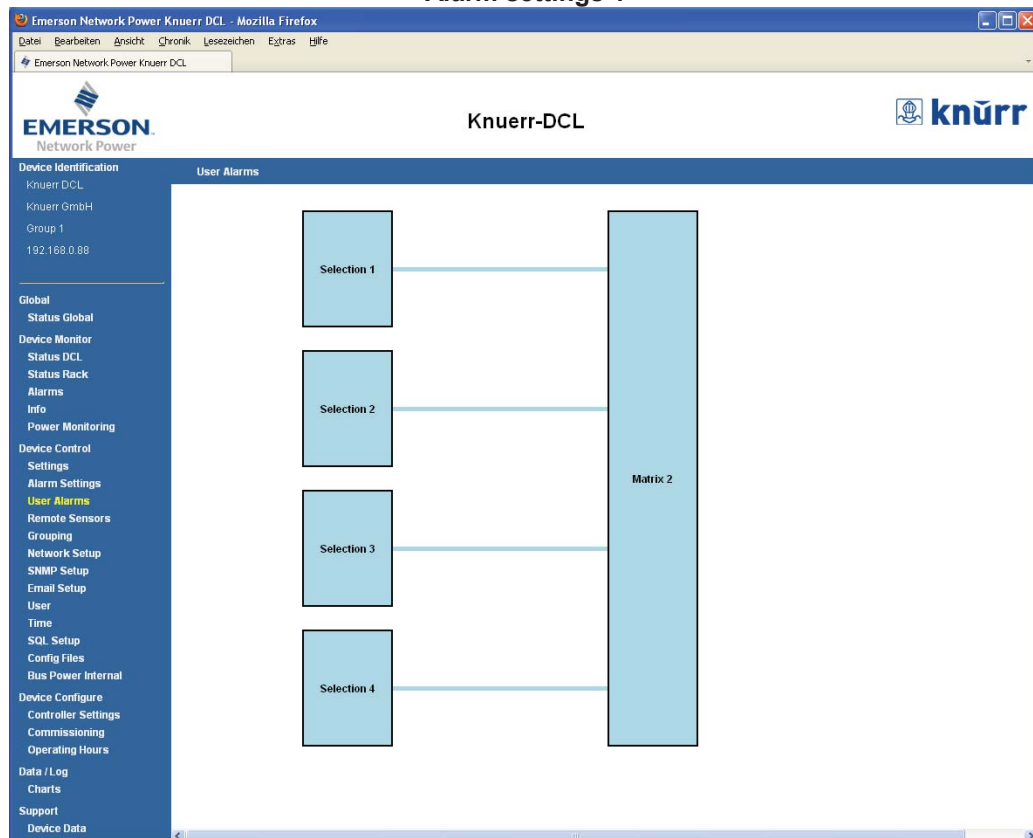
Relative Humidity

setpoint	0.0 %rF
lower alarm	0.0 %rF
upper alarm	0.0 %rF

Chilled Water

supply lower temperature alarm	0.0 °C
supply upper temperature alarm	0.0 °C
return lower temperature alarm	0.0 °C
return upper temperature alarm	0.0 °C
supply 2 lower temperature alarm	0.0 °C
supply 2 upper temperature alarm	0.0 °C
return 2 lower temperature alarm	0.0 °C
return 2 upper temperature alarm	0.0 °C

Alarm settings 1



User alarms 1

Emerson Network Power Knuerr DCL - Mozilla Firefox

Emerson Network Power Knuerr DCL

EMERSON Network Power **knürr**

Knuerr-DCL

Device Identification
Knuerr DCL
Knuerr GmbH
Group 1
192.168.0.88

Global
Status Global
Device Monitor
Status DCL
Status Rack
Alarms
Info
Power Monitoring
Device Control
Settings
Alarm Settings
User Alarms
Remote Sensors
Grouping
Network Setup
SNMP Setup
Email Setup
User
Time
SQL Setup
Config Files
Bus Power Internal
Device Configure
Controller Settings
Commissioning
Operating Hours
Data / Log
Charts
Support
Device Data

User Alarm Setup 1

save overview

Alarm Selection 1

---	invert
---	<input type="checkbox"/>
---	<input type="checkbox"/>
---	<input type="checkbox"/>
---	<input type="checkbox"/>
---	<input type="checkbox"/>
---	<input type="checkbox"/>
---	<input type="checkbox"/>
---	<input type="checkbox"/>
---	<input type="checkbox"/>

OR Matrix 2

General

summary alarm
external cooling device

Fan Alarms

fan 1 fault
fan 2 fault
fan 3 fault
fan 4 fault
fan 5 fault
fan 6 fault

Temperature Alarms

supply air temp. lower alarm
supply air temp. upper alarm 1
supply air temp. upper alarm 2
supply air temp. upper alarm 3
supply air temp. upper alarm 4
return air temp. lower alarm
return air temp. upper alarm 1
return air temp. upper alarm 2

User alarms 2

Emerson Network Power Knuerr DCL - Mozilla Firefox

Emerson Network Power Knuerr DCL

EMERSON Network Power **knürr**

Knuerr-DCL

Device Identification
Knuerr DCL
Knuerr GmbH
Group 1
192.168.0.88

Global
Status Global
Device Monitor
Status DCL
Status Rack
Alarms
Info
Power Monitoring
Device Control
Settings
Alarm Settings
User Alarms
Remote Sensors
Grouping
Network Setup
SNMP Setup
Email Setup
User
Time
SQL Setup
Config Files
Bus Power Internal
Device Configure
Controller Settings
Commissioning
Operating Hours
Data / Log
Charts
Support
Device Data

User Alarm Setup 2

save overview

Outputs Matrix 1

---	invert
---	<input type="checkbox"/>
---	<input type="checkbox"/>
---	<input type="checkbox"/>
Selection 1	
Selection 2	
Selection 3	
Selection 4	

OR OFF

Outputs Matrix 2

---	invert
---	<input type="checkbox"/>
---	<input type="checkbox"/>
---	<input type="checkbox"/>

OR OFF

Outputs Matrix 3

---	invert
---	<input type="checkbox"/>
---	<input type="checkbox"/>
---	<input type="checkbox"/>

OR OFF

Outputs Matrix 4

---	invert
---	<input type="checkbox"/>
---	<input type="checkbox"/>
---	<input type="checkbox"/>

OR OFF

User alarms 3

Emerson Network Power Knürr DCL - Mozilla Firefox

Emerson Network Power Knürr DCL

Knürr-DCL

Device Identification

Knürr DCL
Knürr GmbH
Group 1
192.168.0.88

Global
Status Global

Device Monitor
Status DCL
Status Rack
Alarms
Info
Power Monitoring

Device Control
Settings
Alarm Settings
User Alarms
Remote Sensors
Grouping
Network Setup
SNMP Setup
Email Setup
User
Time
SQL Setup
Config Files
Bus Power Internal

Device Configure
Controller Settings
Commissioning
Operating Hours

Data / Log
Charts
Support
Device Data

Network Setup

save apply

Network Settings LAN 1

Bridge ☐
DHCP ☐
Fix IP ☒
IP-Address 192.168.0.88
Subnet Mask 255.255.255.0
Gateway
DNS Server

Network Settings LAN 2

DHCP ☐
Fix IP ☒
IP-Address 1.1.199.210
Subnet Mask 255.255.255.0
Gateway
DNS Server

Network setup

Emerson Network Power Knürr DCL - Mozilla Firefox

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SNMP Setup

save apply

SNMP Version

Version v1 ☐
Version v2c ☒
Version v3 ☐

SNMP v1 / v2c

read community public
write community private
Trap Host 1 1.1.199.101
Trap community 1 public
Trap Host 2 1.1.199.201
Trap community 2 public
Trap Host 3
Trap community 3
Trap Host 4
Trap community 4

System

sysDescription Knürr CoolCon 2
sysOID 1.3.6.1.4.1.2769.2.4
sysLocation Knürr GmbH
sysContact Service <service@knürr.com>

SNMP v3

USM User
Security Level noauth
Authentication Type MD5
Authentication Key
Privacy Type DES
Privacy Key

v3-Trap-Host 1
v3-Trap-Host 2
v3-Trap-Host 3
v3-Trap-Host 4

Engine-ID

save hostname

Hostname

Hostname Knürr-DCL

SNMP setup

Emerson Network Power Knuerr DCL - Mozilla Firefox

Datei Bearbeiten Ansicht Chronik Lesezeichen Extras Hilfe

Emerson Network Power Knuerr DCL

EMERSON Network Power **Knuerr-DCL** knürr

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Email Configuration

save

SMTP Server Address

Sender

To

Cc

Bcc

Subject Prefix

Test

Email setup

Emerson Network Power Knuerr DCL - Mozilla Firefox

Datei Bearbeiten Ansicht Chronik Lesezeichen Extras Hilfe

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Device Data

SQL Setup

save

IP address

Port

Database Name

User

Password

Database Type
MySQL ☒
MS-SQL ☐
Oracle ☐

Write Cycle (minutes)

SQL setup

Emerson Network Power Knuerr DCL - Mozilla Firefox

Emerson Network Power Knuerr DCL

EMERSON Network Power **knürr**

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User Administration

Create User

User	Name	Password	Password repeat	Type	
User 1	user			user	create
User 2	admin			admin	create
User 3				user	create
User 4				user	create
User 5				user	create
User 6				user	create
User 7				user	create
User 8				user	create

Delete User

Name: user Password: delete

User password

Emerson Network Power Knuerr DCL - Mozilla Firefox

Emerson Network Power Knuerr DCL

EMERSON Network Power **knürr**

Knuerr-DCL

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System Time

Day: 12
Month: 03
Year: 2012
Hour: 16
Minute: 32
Second: 12

save

NTP Server:

save

Time settings

Service section

Emerson Network Power Knuerr DCL - Mozilla Firefox

Emerson Network Power Knuerr DCL

EMERSON Network Power **Knuerr-DCL** **knürr**

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Charts

Support
Device Data

Controller Settings

save

Fan Controller

Function: Manual

Manual Value: 29 %

Kp: 1.0

Tn: 260.0 s

Tv: 0.0 s

Control Sensor: Return

Control Sensor Calculation: Maximum

Weighting Sensor Top: 0 %

Weighting Sensor Middle: 0 %

Weighting Sensor Bottom: 100 %

Maximal Fan Speed: 100 %

Minimal Fan Speed: 0 %

Valve Controller

Function: Manual

Manual Value: 53 %

Kp: 1.0

Tn: 260.0 s

Tv: 0.0 s

Control Sensor: Supply

Control Sensor Calculation: Maximum

Weighting Sensor Top: 100 %

Weighting Sensor Middle: 100 %

Weighting Sensor Bottom: 100 %

Valve Closed Position Limit: 100 %

Valve Open Position Limit: 0 %

Controller settings

Emerson Network Power Knuerr DCL - Mozilla Firefox

Emerson Network Power Knuerr DCL

EMERSON Network Power **Knuerr-DCL** **knürr**

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Charts

Support
Device Data

Operating Hours

Fans

fan 1: 6 Reset

fan 2: 0 Reset

fan 3: 1 Reset

fan 4: 0 Reset

fan 5: 0 Reset

fan 6: 0 Reset

Hours of operation

7 Maintenance and repair



WARNING. Risk of arc flash, electric shock, high and low temperatures and high speed rotating fan blades. Can cause equipment damage, injury and death. Disconnect local and remote electric power supplies and wear appropriate personal protective equipment per NFPA 70E and allow the component temperatures to become safe for human contact before removing protective covers and working within. If the doors are opened immediately after the Knürr DCL has been switched Off, the following risks are present:

- Electrical heaters, outlet area may remain at high temperature about 212°F (100°C);
- the piping may remain at low temperature;
- fan blades may continue to rotate.

These residual risks are highlighted by warning labels on the **Knürr DCL**.



WARNING. Risk of electrical shock. Can cause injury and death. Disconnect all local and remote electric power supplies before working within. Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the unit voltage matches available utility power. Microprocessor controller does not isolate power from the unit, even in the Unit Off mode. Some internal components require and receive power even during the Unit Off mode of the embeded controller. An optional factory-supplied disconnect switch may be installed is inside the unit. The line side of this switch contains live high voltage when switched off. You must open all local and remote electric power disconnect switches to ensure that there is NO live hazardous voltage potential inside the unit. Refer to the unit electrical schematic. Follow all local codes.

Risk of improper maintenance. Can cause equipment damage. All maintenance must be performed only by authorized properly trained and qualified personnel

All maintenance operations must strictly observe national, state and local accident prevention regulations, especially the regulations concerning electrical systems, refrigerators and manufacturing resources. Air conditioning equipment maintenance may be performed only by authorized properly trained and qualified personnel. To keep all warranties valid, the maintenance must adhere to the manufacturer's regulations.

Ignoring safety instructions can be dangerous to persons as well as to the environment. Soiled parts always cause a loss of performance and, for switch or control devices, can lead to the breakdown of a plant.

Only original spare parts made by Emerson Network Power may be used. Using third-party material can void the warranty. When making seeking technical assistance, always refer to the component list supplied with the equipment, and specify the model number, serial number and, if available, the part number.

Conduct monthly, quarterly, biannual and annual checks according to the following guidelines.



NOTICE. When replacing a component, follow the relevant manufacturer instructions. When the replacement parts must be brazed, be careful not to damage the internal parts (gaskets, seals, O-rings, etc.).

All tasks and time periods listed here are the manufacturers' regulations and must be documented in an inspection report.

Follow the maintenance schedule bellow (skip the parts with no relation to your unit)

Component		Maintenance period			
		Monthly by user	Every 3 months	Every 6 months	Annually
General	Check unit display for clogged - filter warning	X			
	Check for irregular noises from the unit fans	X			
Filters	Check state of the filters		X		
	Replace filter if necessary		X		
	Check filter switch functionality			X	
Fans	Verify impellers move freely		X		
	Check bearings			X	
	Check motor mounts for tightness			X	
Electrical/Electronics	Check condition of contacts			X	
	Check electrical connections				X
	Check operation of controller			X	
	Check unit operation sequence			X	
Chilled water circuit	Check for leakages / general condition		X		
	Check water inlet and outlet temperatures			X	
	Check water valve operation			X	
Air circuit	Check coil condition			X	
	Check pipeline conditions			X	
Water pump	Check functionality			X	

Maintenance schedule

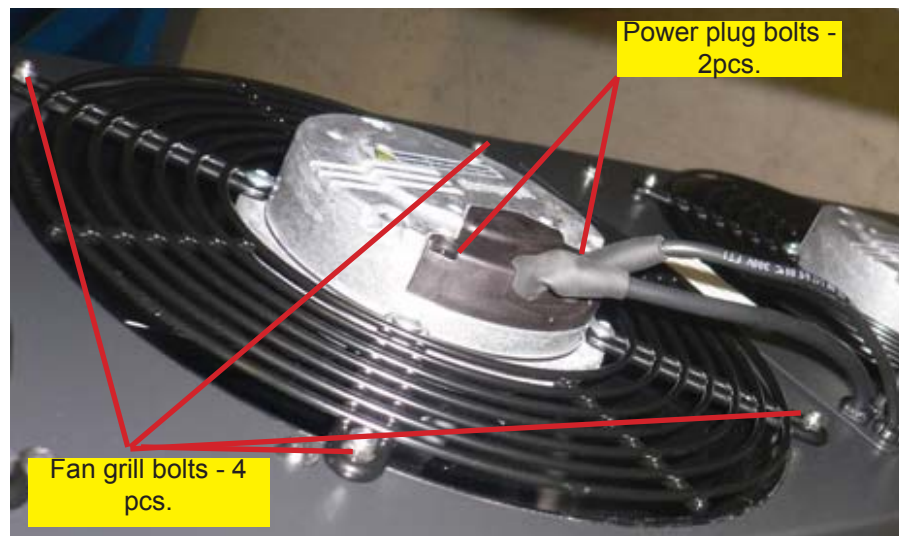
Problem	Possible cause	Corrective action
Rack temperature is too high	Dirty filters	Replace filter
	Faulty filter clogs	Call service
	Incorrect positioning of temperature sensors	Verify remote temperature sensors correct positioning
	Remote temperature sensor issue	Call service
	Inlet water temperature is too high	Check cooling water temperature
	Cold - hot air short circuit	Verify unit positioning /Check containment sealing
	Insufficient room cooling capacity	Reduce rack heat load or add cooling units
	Water regulating valve issue	Call service
	Unit safety devices intervention	Call service
Unit fan fails to start	Faulty fan	Call service
Water drops carried by airflow	Room humidity is off the limit	Check room conditioning
	Condensate tray is clogged	Call service
Water on the floor around the unit	Unit is not properly levelled	Adjust the levelling feet
	Condensate pipe is clogged	Remove pipe obstruction
	Water circuit leak	Locate the leak and fix it
	Broken piping insulation	Repair the insulation
	Leak in drain circuit	Call service
	Condensate pump is faulty	Call service
Noise level is higher than expected	Incorrect positioning of remote temperature sensors	Verify remote temperature sensors correct positioning
	Unbalanced heat load	Enhance rack heat load distribution
	Remote temperature sensor issue	Call service
Unsteady air delivery temperature	Faulty temperature sensors	Call service
	Unit controller issue	Call service
Local display not operational but unit operates	Display cable disconnected	Connect the cable
	Display cable damaged	Replace the cable
	Local display configuration lost	Call service
Local display not operational and the unit does not operate	Unit electrical supply is off	Restore power supply
	Main switch is off	Switch the unit on
	Control board issue	Call service

Basic troubleshooting

Replace fans

(Their normal lifecycle is approx. 40,000 operating hours at a temperature of 40°C)

1. Switch off the fan circuit breaker (Caution! Fan blades keep rotating by inertia for a while after being switched off)
2. Unscrew two bolts securing the fan power cord plug and pull the plug off
3. Unscrew four nuts holding the fan grill
4. Carefully slide the fan out and replace



To insert the replacing fan, proceed in reverse sequence

- Fasten the bolts fixing the fan
- Switch the circuit breaker ON again



Properly dispose of the replaced fan!

General check of the cooler (annually)

- Check heat exchanger for being soiled on the air side or for damage.
- Check feed and return if functional.
- If required, clean the air side.
- Visually check the water circuit at regular intervals for tightness.



Heavily soiled heat exchangers are largely limited in their operation and must immediately be cleaned. For cleaning their lamellae, use a vacuum cleaner, compressed air or a soft brush. When cleaning the lamellae, do not bend them. This will increase pressure loss.



Regularly check the condensed water drain and, if necessary, clean it.

8 Disassembly and disposal



Properly switch OFF all fans and other electrical components and disconnect them from their power supply!






Protect them against being re-connected!



Stop the water circuit and prevent it from being re-started.



	Disassembly of the DCL unit unit may be performed by qualified personnel only
	Shut down the chilled water system before disassembly and prevent it from restarting.
	<p>Dispose all the components and parts in accordance with local waste management and regulations. We recommend a recycling company.</p> <p>All components consist of:</p> <ul style="list-style-type: none"> • Aluminium, steel, brass, copper • Marked plastic components

9 Customer service and applicant's address

EMERSON NETWORK POWER - EMEA
Racks and Solutions
Knürr GmbH
Mariakirchener Str. 38
94424 Arnstorf Germany

T +498723270

T +49872327154

thermalmanagement.EMEAhelpdesk@emerson.com
servicecooling.networkpower.emea@emerson.com

10 Annexes

10.1 Quality requirements for water

Water impurity	Method for removal
Mechanical impurity (dp < 0.3 mm)	Filter the water
Excess hardness	Soften the water by ion exchange
Moderate level of mechanical impurities and hardeners	Add dispersion or stabilizing agents
Moderate level of chemical impurities	Add deadening agents and inhibitors
Biological impurities (bacteria and algae)	Add biocides

Hydrological data	Values	
pH values	(7 ÷ 10,5)	
Carbonate hardness	(3 ÷ 8)	°dH
Free carbon dioxide	(8 ÷ 15)	mg/dm ³
Combined carbon dioxide	(8 ÷ 15)	mg/dm ³
Aggressive carbon dioxide	0	mg/dm ³
Sulphides	< 10	mg/dm ³
Oxygen	< 50	mg/dm ³
Chloride ions	< 250	mg/dm ³
Sulphate ions	< 10	mg/dm ³
Nitrates and nitrites	< 7	mg/dm ³
COB	< 5	mg/dm ³
Ammonia	< 5	mg/dm ³
Iron	< 0.2	mg/dm ³
Manganese	< 0.2	mg/dm ³
Conductivity	< 30	uS/cm
Solid residue from evaporation	< 500	mg/dm ³
Potassium manganese consumption	< 25	mg/dm ³
Suspended matter	< 3	mg/dm ³
(partial flow cleaning is recommended)	(3 ÷ 15)	mg/dm ³
(permanent cleaning)	> 15	mg/dm ³

10.2 Check list for setting up the device

Performed checks	Done (to be signed upon completion)	Notes
Check device for damage upon receipt.		
Check the ground for being horizontal.		
Check bearing capacity of ground.		
Add-on and align, connect to server cabinet, position feet of Knürr DCL and adjust them horizontally		
Cables connected with server cabinet: - Temperature sensors (optional) - Server shut-down (optional) - Automatic door opening - Door contact (optional) - Fire alarm systems (optional)		
Cable connected with set of external valves (optional): - Valve drive - Flowmeter with temperature sensors (optional)		
Optional automatic door opening adjusted at server cabinet		
No remains of packaging inside Knürr DCL		
All assembly tools removed		
Cable bushings into the device proper and air-tight		
Cable connections checked (power supply)		
Chilled water connection leak-proof / pressure-tested		
Chilled water system deaerated		
Volume flow of chilled water adjusted		
Condensed water line unobstructed		
Smell trap of chilled water system functional		
Cooler tub connected to condensed water line		
Fans checked for function		
All front panels closed (air ducts technically separated)		

Place:

Date:

Signature
of Tester

10.3 Commissioning protocol

Knürr DCL Commissioning Protocol

1. General Details

1.1 Customer/Site of installation

Customer's name:

Customer's address:
.....
.....

Contact partner:

Phone number:

Site of installation / room number:

Humidity at site of installation: % rel. humidity

Ambient temperature ° C

1.2 Configuration

Cabinet type:

Knürr DCL 30 kW <input type="checkbox"/>	Knürr DCL 34 kW <input type="checkbox"/>
DCL - R <input type="checkbox"/>	DCL - L <input type="checkbox"/> DCL - H <input type="checkbox"/>

Commisson number:

Serial number:

Special remarks:

.....

.....

.....

2. State Check

2.1 General State

Customer's proof of bearing capacity of ground / transport ways ☐

Check of alignment ☐

Transport damage to housing: yes ☐ no ☐

Remarks

.....

.....

.....

Residual packaging removed: yes ☐ no ☐

2.2 Chilled Water System within the Facility

2.3 Electrical Data/ Documents

Cabling checked:

3. Functional Check

3.1 Mechanical Functions

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Pipe duct inlets / cable bushings closed: yes ☐ no ☐
Remarks:

Condensed water drain open / connected: yes ☐ no ☐
remarks:

Fans run perfectly (bearings OK)
Visual check yes ☐ no ☐
Remarks:

3.2 Electrical Functions

Functional check of valve / fan control yes ☐ no ☐
Remarks:

Functional check of smoke alarm (optional) yes ☐ no ☐
Remarks:

Functional check of temperature control (optional):
yes ☐ no ☐
Remarks:

Functional check
of automatic door opening (optional) yes ☐ no ☐
Adjustment of electric magnets – see Operation Manual “Automatic Door Opening / Initial Commis-
sioning”
Remarks:

Functional check of water alarm (optional) yes ☐ no ☐
Remarks:

Check for error / disturbance alarms yes ☐ no ☐
Remarks:

3.3 Thermodynamic Checks

Condensed water forming at heat exchanger yes ☐ no ☐
Remarks:

Chilled water entering heat exchanger: ° C

Chilled water leaving heat exchanger: ° C

Cabinet temperature in front of heat exchanger: ° C

Cabinet temperature behind of heat exchanger: ° C

Chilled water network bled: yes ☐ no ☐

Pressure of chilled water network tested: yes ☐ no ☐
(customer's protocol available)

Volume flow adjusted: yes ☐ no ☐
external ☐ l / min external ☐

Remarks:
.....

Correctness of above values is hereby confirmed.
Commissioning was performed during on-going operation.

.....
Commissioning firm Date Signature

.....
Customer Date Signature

10.4 Electrical box connectors description

Terminal XTS	Pin	Function	Description
	1	COM (+24V)	door contacts
	2	NC	door contact front door closed
	3	COM (+24V)	
	4	NC	door contact rear door closed
	5	free	
	6	free	
Terminal XAB	Pin	Function	Description
	1	COM (+24V)	A+B transfer switch
	2	NC	Mains A powered ON
	3	COM (+24V)	
	4	NC	Mains B powered ON
	5	free	
	6	free	
Terminal XAI	Pin	Function	Description
	1	free	
	2	free	
	3	free	
	4	free	
	5	COM (+24V)	water alarm
	6	NO	
Terminal XSP1	Pin	Function	Description
	1	+24V (supply)	Power supply switch
	2	GND (supply)	
	3	free	
	4	free	
	5	free	
	6	free	
Terminal XPFC	Pin	Function	Description
	1	NC	relay general alarm
	2	NO	default: relay deactivated for failure (software invertable)
	3	COM	
	4	free	
	5	COM (+24V)	Failure cooling unit (external)
	6	NC	default: wire bridge
Terminal XSP2	Pin	Function	Description
	1	free	
	2	free	
	3	free	
	4	free	
	5	free	
	6	free	

Terminal XSP3	Pin 1 2 3 4 5 6	Function free free free free free free	Description
Terminal XBLK	Pin 1 2	Function Out (1= ON) GND	Description beacon
Terminal XCPA	Pin 1 2	Function COM (+24V) NC	Description condensate pump failure
Terminal XSA	Pin 1 2 3 4	Function +24V (supply) GND (supply) COM (+24V) NO	Description smoke alarm
Terminal XHU	Pin 1 2 3 4	Function +24V (supply) GND (supply) 0-10V(GND) 0-10V(+)	Description air monitoring humidity
Terminal XCP	Pin 1 2 PE	Function 230V L 230V N PE	Description condensate pump power

X15,X16 (not on the rear of the E-box, cable ending near valve)

Terminal X15	Pin 1 2 3 4 5 6	Function +24V (supply) GND (supply) 0 – 10VDC free 2 – 10VDC free	Description Valve control valve position feedback valve position
Terminal X16	Pin 1 2 3 4 5 6	Function +24V (supply) GND (supply) 0 – 10VDC free 2 – 10VDC free	Description Valve - redundant heat exchanger control valve position feedback valve position